TM-112100-G4

VOLUME 2 -- SERVICE MANUAL

UNIVERSAL DISTURBANCE ANALYZER

MODEL 626G

May 15, 1991

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Installation, operation, and maintenance should be performed only by qualified personnel.

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May 15, 1991

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FORWARD

This Technical Manual is Volume 2 of TM-112100-G4 and contains the technical support information related to the 626G's theory of operation, maintenance, parts listing, and all assembly and schematic diagrams.

Volume 1 of this manual contains the operator's support information and consists of information related to the installation and operation of the 626G.

Volume 1 is part of the accessories received with the purchased 626G. Volume 2 is ordered separately as an optional accessory. Refer to Chapter VI for ordering information.

Information contained in this Technical manual does not relate to the operation or maintenance of Plug-in Printed Circuit Boards that are required for monitoring data. These PCB's are listed in Table 4- 6 and the technical manuals associated with their operation or maintenance may be ordered from Dranetz also.

SECTION IV

THEORY OF OPERATION

4.1 INTRODUCTION

This section contains the block diagrams and detailed descriptions of the following components of the Dranetz 626G Universal Disturbance Analyzer: Power Supply, Mainframe CPU, Front Panel Logic and Printer Control.

4.2 MAINFRAME BLOCK DIAGRAM DESCRIPTION (FIGURE 4-1)

The Power Supply provides DC power for all the mainframe's functions and includes a battery pack that furnishes back-up power; it also maintains RAM and real time while the power is turned off.

The Mainframe CPU provides real time signals and controls all 626G operations by responding to instructions in accordance with a stored program. All plug-in functions enter the 626G system by way of the Control Board via the Motherboard. The CPU also senses loss of AC power and the transfer to battery power.

The Front Panel Logic is controlled by the Mainframe CPU. Data from the upper and lower keyboards, the two keyswitches and the paper low switch is decoded by the logic and processed by the CPU. The Keyboard Logic also drives the front panel LEDs.

Thermal Printer A10 is a continuous line printer, with graphics capability, that provides line by line printouts. The time is printed, to 10 mSec resolution, whenever an event printout occurs. The printer hardware for mechanical control of the printer is found on the Printer Control Board A11. Controlled functions include the stepper motor, the take-up motor and the burning of dots on the thermal paper roll.

4.3 POWER SUPPLY

4.3.1 Block Diagram Description

The 626G power supply function, figure 4-2, is contained on the Power Supply PCB A1, Keyboard Logic PCB A8, and Motherboard A9. In addition, the Battery Pack provides the UPS backup power. The circuitry consists of the following functional sections.

1) An input filter/suppressor to reduce input noise and suppress conducted EMI.

2) AC input control and selection to control application of the AC input and to select either 115VAC or 230VAC operation.

3) A switching regulator to generate the DC rail voltage required to charge the battery, operate the fan, and to provide the multiple DC-DC converter inputs for further DC voltage generation of +5 V, ±12 V and +15 V.

5) A battery charging circuit used for charging the battery internal to the 626G mainframe (battery pack).

6) A +5V DC converter for operation of logic circuitry of PCBs A2-A8, and A11.

7) A ±12V DC converter for operation of operational amplifiers in PCB's A2-A7.

8) A +15 V DC converter for printer operation.

9) Logic circuit signals to indicate:

   a) When AC power is lost (AC SENSE),
   b) When battery voltage is below 10.0 V (BATT SENSE), and
   c) Whether the 626G is operating under AC control or battery control (LINE LED is green, BATT LED is red).

10) A shutdown circuit which turns off the power supply upon receipt of the *SHUTDOWN signal from the CPU.

NOTE *An asterisk (*) preceding a signal name denotes the logical NOT condition, equivalent to SHUTDOWN, used in figures and schematic diagrams.*

11) An external battery connector to enable the power supply to run for an extended time interval if an optional external battery is used.

NOTE *The internal battery must be connected in order to make use of the external battery connector.*

12) A RAM backup voltage of +5 V standby, created from battery voltage.

13) A battery pack.

4.3.2 Detailed Description

Refer to the schematic diagram of the power supply PCB, A1, figure 7-8, for the following discussion of the power supply circuitry. For power supply component location refer to the assembly drawing, figure 7-7.

4.3.2.1 Input Filter and Transient Suppression

Input AC of 115 VAC or 230 VAC at 47-450 Hz is coupled through input jack J2, noise suppressor filters C40 and C39 and 2 A, fast-blow fuse F1 to thermistor R42. Thermistor R42 is 40 ohms at power turn-on and limits surge current. As the thermistor is heated, its resistance decreases to a value under 1 ohm. The power dissipation of R42 is thus insignificant with steady state operation of the power supply. Varistor R43 clips any voltage transients above 275V RMS that manage to pass through the noise filters, lowering transient frequencies, thus reducing electrostatic coupling.

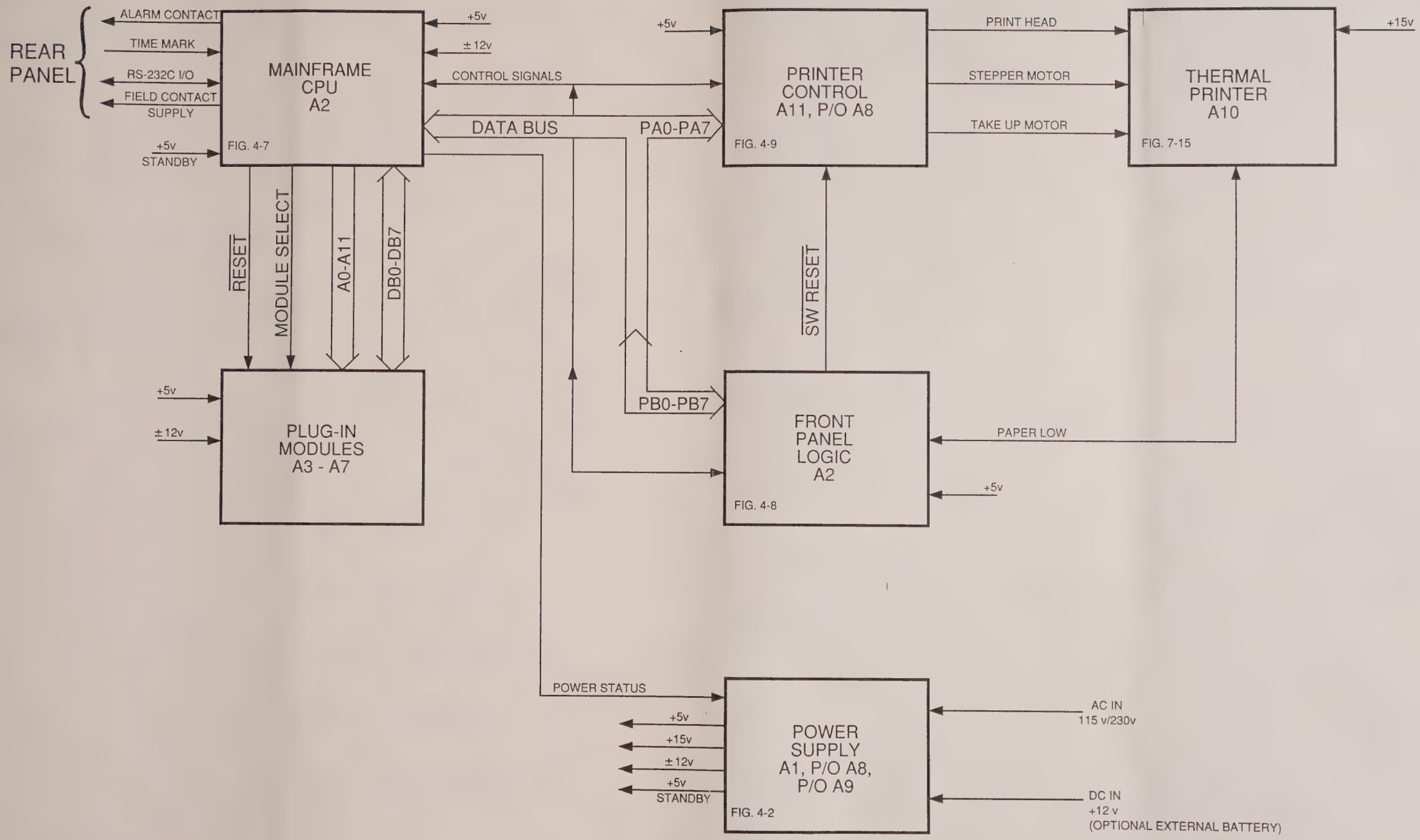


Figure 4-1. Model 626G Mainframe. Block Diagram

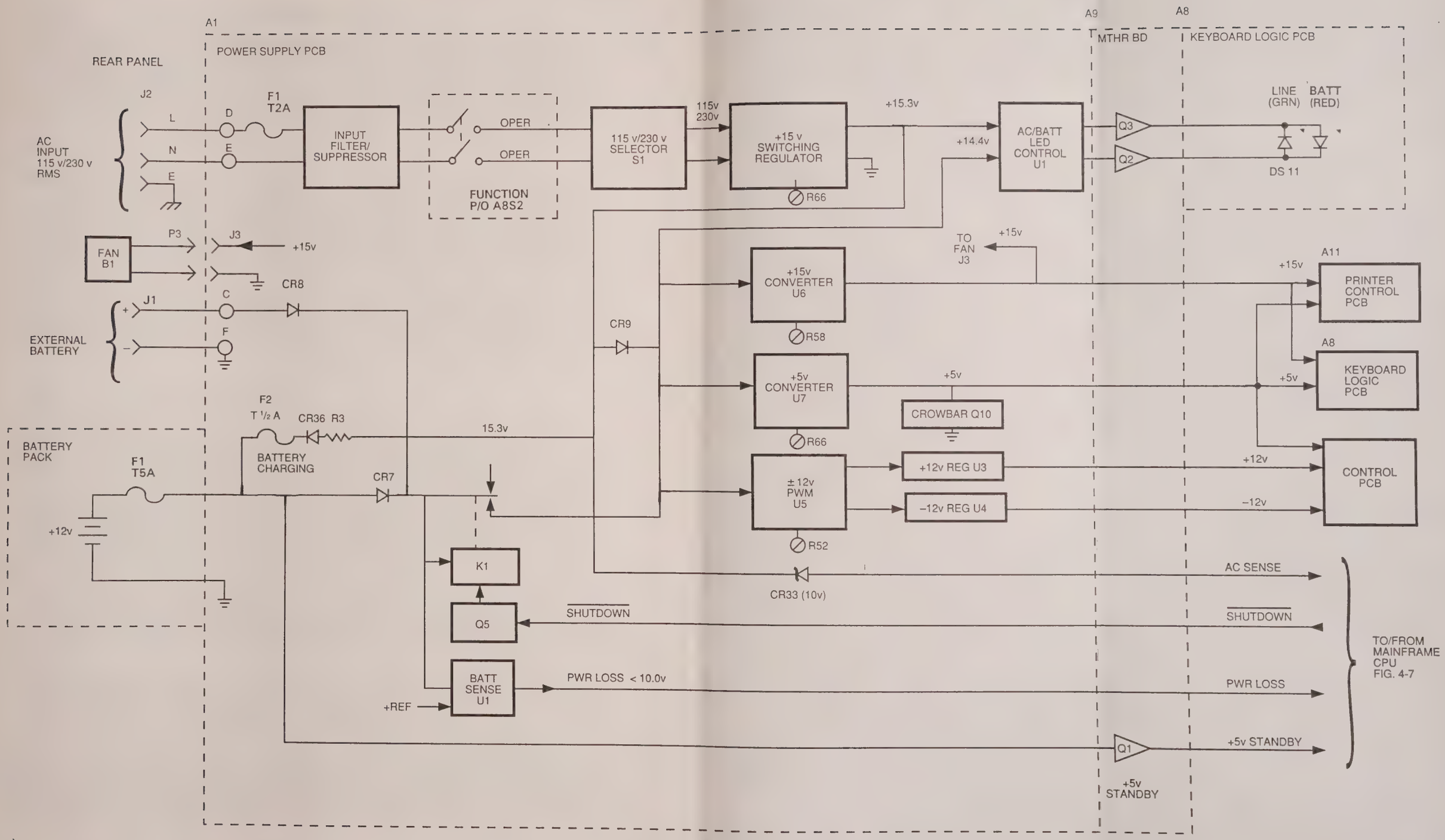


Figure 4-2. Power Supply, Block Diagram

4.3.2.2 AC Control and Input Voltage Selection

FUNCTION selector, S2, on the Keyboard Logic PCB A8, (see system wiring diagram, figure 7-2) applies AC input power to the 626G in the OPERATE, CLEAR DATA, or RESET selected position. In each of these selections input AC is applied to the 115V/230V selector switch, S1, mounted on the rear panel of the mainframe (figure 7-5). With S1 in the 115 V position, transformer T4 is connected with both primary windings in parallel. In the 230 V position of S1 the primary windings are connected in series.

4.3.2.3 AC to DC Conversion

The AC input voltage of either 115 V or 230 V supplied to connector J2 is converted to +325 VDC, for either input, by a circuit whose configuration is determined by the setting of selector switch S1. Figure 4-3 is a simplified diagram of the 115V configuration. The primary windings of T4 are connected in parallel across the 115V input, producing a secondary voltage of 36V RMS center tapped. Bridge rectifier CR27-CR30 and filter capacitors C29 and C30 are connected as a voltage doubler. The unregulated DC voltage developed across C29 and C30 is 2 x 115 x 1.414, or 325 volts.

Figure 4-4 shows the 230V configuration. In this case, the primary windings of T4 are connected in series across the 230V RMS input. Again, the secondary winding of T4 yields 36V RMS center tapped. The bridge rectifier circuit provides a DC voltage of 230V x 1.414, or 325 volts.

4.3.2.4 15V Switching Regulator

The 36V RMS center-tapped output of transformer T4 is full-wave rectified by CR25 and CR26, then filtered by CR26. (See fig. 7-8.) Resistor R59 provides a minimum load. The DC voltage across capacitor C26 powers pulse width modulator (PWM) U2 at pin 15. The oscillator internal to the PWM begins to operate since the common mode voltage at pin 2 is set to 2.5V by R22 and R32. Pulses appear at pins 11 and 14 of U2 at alternate half cycles, turning on transistors Q4 and Q3, respectively. Transistor Q4 turns on Q7 via transformer T2 (pins 2 to 3). During the Q4 off-time, the voltage reversal across the windings of T2 allows current to flow through diode CR15 and winding 1-2 of T2. This prevents the generation of voltage spikes that might damage Q4. A "dead time" between the time Q4 turns off and Q3 turns on prevents transistor overlap.

The operation of Q3 as it drives transistor Q2 via transformer T1 is the same as described for Q4, T2, and Q7. In this fashion, Q7 and Q2 are driven on for each cycle of pulse width modulator U2. Turn-off of Q7 and Q2 is effected by base-emitter resistors R40 and R15, respectively. Diodes CR14 and CR12, respectively, are used to remove charge from the bases.

Capacitors C29 and C30 and transistors Q2 and Q7 are used in a half bridge configuration to drive transformer T5. (See fig. 4-5.) Capacitor C28 prevents transformer T5 from saturation caused by mismatches introduced by Q2 and Q7.

The DC component of the waveform changes for every half cycle of pulse width modulator U2. When Q2 is on, current flows through C30, C28, T5, and Q2, and the voltage developed across the primary of T5 is referenced to ground. When Q7 is on, current flows through Q7, T5, C28, and C29, and the voltage across the primary of T5 is referenced to the voltage seen by C28 (approximately +Vdc/2).

Since transistors Q7 and Q2 drive current through the primary of T5 on alternate pulses, each transistor is provided with an RC snubber circuit to dissipate energy at turn-off. RC networks R39/C27 and R17/C3 are used to charge a capacitor when the associated switching transistor (Q7 and Q2, respectively) is tuned off. This enables the primary of T5 to dissipate power in the snubbers, rather than the power transistors, at transistor turn-off. Diodes CR13 and CR11 are used with the snubbers to provide a current path for the primary winding of T5.

The voltages developed across the secondary windings of T5 are rectified and filtered to a DC voltage level by CR16, L4, and C4. The DC output voltage can be adjusted by resistive divider R27, R18, and R26. The voltage at the arm of potentiometer R18 is monitored by U2-1, the inverting input of the PWM error amplifier. U2-1 and U2-2 compare inputs to determine the proper pulse width set by pulse width modulator U2. Potentiometer R18 is adjusted to produce +15.3 VDC across C4 and set pulse width. The pulse width will adjust for load and line variations sensed by this section of the power supply. The DC output developed across C4 is coupled to the battery charging circuit, AC sense, and to the input of the AC/Battery LED control circuit U1. The DC output coupled through CR9 is used to power the other converters on the power supply board.

At PWM U2, oscillator components C7 and R21 set the switching frequency to 21 kHz. Components C5, R20, C6, CR5, R19, CR4 and C9 set the compensation of the error amplifier (pins 1, 2, and 9). The dead band from the PWM is limited by R19, CR5, and C9 by clamping the error amplifier voltage to prevent pulse overlap.

4.3.2.5 +5V DC Converter

The +5V DC Converter is a flyback switcher type regulated power supply. The converter consists of the following functional sections:

1) An input filter L9 and C33,

2) A pulse width modulator and related circuits: U7,R71, C34, C35, R77, R72, and R73

3) Current limiting circuit: R70, Q13, R75, and R76,

4) A switching pass transistor Q12,

5) Driver circuit R69 and R74,

6) Flyback diode CR32,

7) An output filter L8 and CR32, and

8) Output voltage adjust R67, R66, and R68.

The input filter (L9 and C33) reduces ripple current and ripple voltage effects reflected to the other voltage converters. Capacitor C33 suppresses the effects of the +5V switching frequency upon the other outputs.

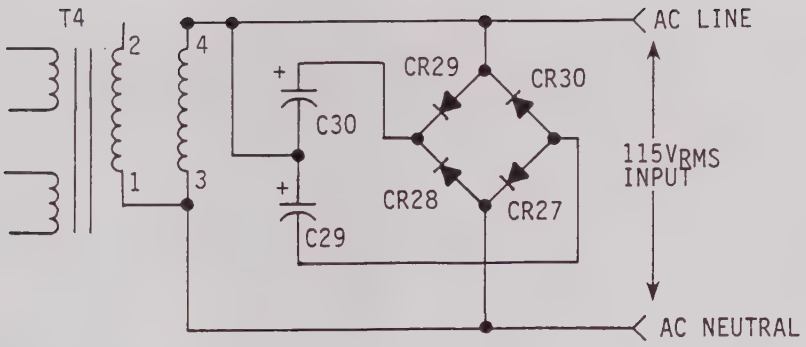


Figure 4-3. 115V Configuration

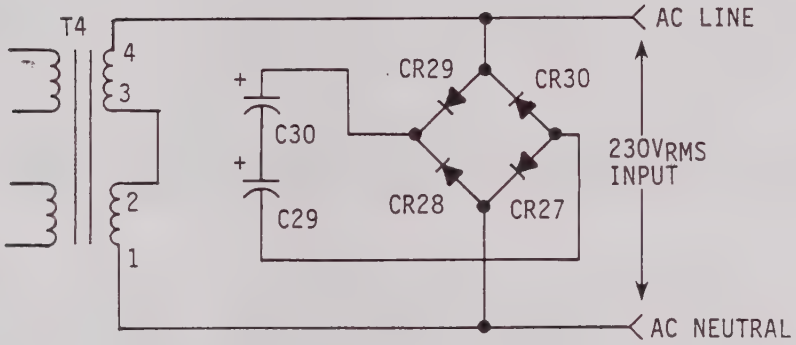


Figure 4-4. 230V Configuration

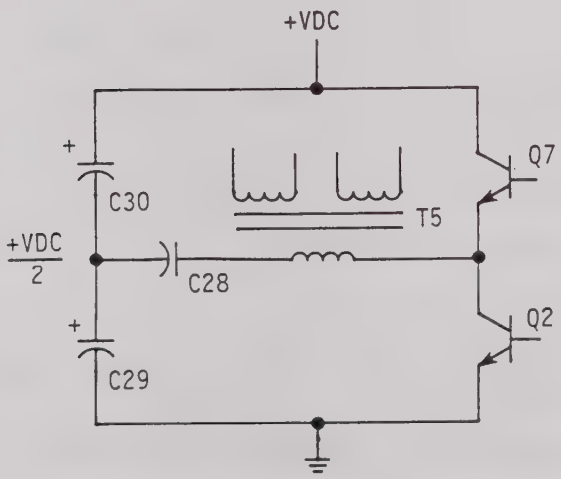


Figure 4-5. Half Bridge Circuit

The current limit function is activated by the voltage drop across R76 (U7-4 to U7-5). In order to develop a potential across R76, transistor Q13 must be turned on. Turn-on of Q13 is caused by peak current detected by R70. The current through R70 provides the necessary forward voltage drop from base-to-emitter of Q13. Current flowing through R75 and R76 is used to increase the voltage across R76 above the value required (200 mV) to activate the current limit of U7.

The oscillator frequency of the PWM is set by R71 and C34. Since both outputs (U7-12 and U7-13) are used, the frequency is the same as U7's internal oscillator frequency, or 23 kHz.

Network C35 and R77 provides compensation for the error amplifier (pins 1, 2, and 9) of U7. C35 and R77 add a zero to the circuit to cancel a pole generated by the output filter L8 and C32. Voltage divider R73 and R72 sets the common mode voltage for the error amplifier.

A driver is required for switching transistor Q12. Proper base current is developed by R74 for Darlington stage Q12. Resistor R69 provides faster charge removal from the base of Q12, and reduces power dissipation at turn-off (less overlap of current and voltage waveforms.)

During the on-time of Q12, current flows through L8, charging capacitor C32. During Q12 off-time, capacitor C32 discharges through diode CR32 to maintain current flow through inductor L8. In this way, a constant voltage and current are always presented to the load.

4.3.2.6 +5V Overvoltage (Crowbar) Circuit

The +5V overvoltage circuit, Q10 and Q11, operates as a crowbar circuit to quickly clamp the +5 V output to ground in the event the output rises above +5.5V. An increase in voltage would occur if the pass transistor Q12 shorted, coupling the +14.4V input to the +5V bus. This increase could damage sensitive components on the logic boards. If the voltage at the +5V output increases above +5.5V, zener diode CR31 conducts and the zener current will cause the voltage across R62 to forward bias the base-emitter of transistor Q10. This turns on Q10 and current flows through R64 and R65. The voltage across R65 is used to turn on SCR Q11. When Q11 conducts, it clamps the output of the +5V converter effectively to ground and causes the power supply to current limit.

4.3.2.7 ±12V DC Converter

The ±12V Converter consists of the following:

1) An input filter L1 and C19,

2) A pulse width modulator U5 and related components: R44, C18, C20, R46, R45, and R51,

3) A double-sided chopper: Q6, Q9, R47, R35, and R48,

4) Transformer T3 (to enable conversion to positive and negative outputs),

5) Two output stages consisting of rectifiers, filters, and regulators, and

6) Current limiting circuit R36 and R37, providing a voltage to pins 4 and 5 of U5.

Input filter L1 and C19 suppresses the effect of the ±12V converter's input transistors Q6 and Q9 from reflecting ripple current and ripple voltage upon the other outputs and to filter high frequency noise appearing at the converter's input.

The frequency of the oscillator internal to U5 is set by C20 and R46. As a result of the chopper configuration used for the converter, the chopper frequency is equal to half the oscillator frequency, or 39 kHz.

The turn-on of Q6 and Q9 is accomplished by providing a gate-to-source voltage to these MOSFETs by resistors R35 and R48, respectively. When Q6 and Q9 are driven on, the voltage is chopped and passed through transformer T3. The secondary voltage is rectified to yield positive and negative voltages. CR19, L2 and C15 are used to rectify and filter the positive voltage; CR23, L5, and C16 rectify and filter the negative voltage. The positive voltage across C15 is monitored by voltage divider R49, R52, and R50. The voltage at the arm of potentiometer R52 is fed back to U5-1 and compared to U5-2. The voltage across C13 should be set to 14.5V by adjusting R52. The voltages across C13 and C16 are regulated by voltage regulators U3 and U4, respectively. Capacitors C10 and C17 are used to improve transient response and to filter the output ripple voltages.

Two methods of current limiting are built into the ±12V converter. Each regulator (U3 and U4) has a self-contained current limiting circuit to provide overload current protection. In addition to this protection, current limit is provided by R36 and R37. These resistors prevent the input current to the regulator from damaging Q6 and Q9. When the voltage developed across R36 and R37 reaches 200 mV, pulse width modulator U5 reduces the pulse width to Q6 and Q9. This reduction in pulse width is used to override the feedback circuit monitored by pins 1 and 2 of U5.

4.3.2.8 Overall Current Limit

Should one of the outputs fail or if the supply is overloaded, the current limit for the switching power supply will be activated. The voltage across R23, used to trigger this current limit, is divided by R24 and R25 and monitored at U2-5. Should the voltage from U2-4 to U2-5 exceed 200 mV, the output voltage at C4 will be reduced because of the reduction in pulse width from U2-11 and U2-14.

4.3.2.9 Printer Power (+15V)

The printer power output is provided by a step-up switching converter. This converter permits printer operation to be maintained even while the power supply board is being operated from a battery source. The printer must operate until a battery voltage of approximately 9.3V (or 10V-V_D) is encountered.

The following components are used in the step-up switching converter: C23, R53-R55, R56, R57, R58, L3, Q8, CR10, C24, C25, and U6.

The converter operates as follows: switching regulator U6 provides base drive to transistor switch Q8. Turn-on of Q8 draws current through inductor L3. Current is limited through L3 and Q8 by resistors R53, R54, and R55. The frequency of switch Q8 is determined by the value of C25 selected for U6.

The frequency of operation is set to approximately 25 kHz. The on-time of Q8 produces a current flow through L3 and Q8. During Q8's on-time, no current can be drawn from the load since isolation diode CR10 prevents the load from being shorted. During the off-time of Q8, the counter emf of the inductor is added to the input voltage to provide the voltage step-up developed at the output. Capacitor C24 is used to smooth the output voltage to the desired level. The output voltage level, set by the voltage sensed at U6-1, can be adjusted by potentiometer R58. The energy stored in the inductor is large enough to handle the input range of 9-15 volts, and provides the output to drive the printer. While the power supply is operating from an AC input, the voltage appearing at the printer power output should be 15V $\pm$ 0.5V.

4.3.2.10 Battery Charging Circuit

Resistor R3, diode CR36, and Fuse F2 are used for the battery charger. This circuit charges the battery pack to 14.5V DC. As the battery voltage is brought up to 14.5V, it will trickle charge at approximately 100 mA. This trickle charge rate can be expected over the operating temperature range. A 1/2A Slow Blow Fuse is provided to fuse the battery charger circuitry.

4.3.2.11 Uninterruptible Power Supply (UPS)

The UPS circuits operate in the voltage range of 9V to 15V, relating to the battery operating range. All the voltage converters are capable of operating within this input range.

The transfer to battery is accomplished by diode OR-ing the battery through diode CR7. The loss of an AC input to the power supply board causes diode CR7 to pick up power to the board when voltage at the anode of CR9 drops below the battery voltage and CR9 becomes back biased.

4.3.2.12 External Battery

A connection is provided for an external 12V battery by using battery connector J1. Connection of a battery through this connector allows for operation of the power supply for an extended period of time in the event that AC input is lost.

Diode CR8 is used to connect the internal and external battery operation points. The voltage from the internal and external batteries would drop until they reach the internal battery cutoff point. The 626G mainframe would subsequently open relay K1 when the processor indicated a shutdown condition.

4.3.2.13 Logic Circuits

Four logic signals are used on the power supply PCB:

1) BATTERY SENSE: For this signal, R10 and R4 are used as a resistive divider for the battery voltage. This voltage is then compared to a reference voltage provided by U1-9. If the battery voltage is approximately 10V, then U1-14 will go high. Resistor R11 provides the required hysteresis. The pull-up resistor for U1-14 is located on the Control Board (A2).

2) AC SENSE: For this signal, CR33 is included on the power supply board and an 8.2K pulldown resistor is located on the Control Board. The AC SENSE signal is used to trigger gates on the Control Board when the AC input is lost.

3) AC LED and BATTERY LED: These signals are used to turn on a status (Red-Green) LED on the front panel of the mainframe. When the LED is green, the power supply is operating from an AC input. When the LED is red, the power supply is running on battery power. Resistors R8, R9, R13, and R14 are used to compare voltages at the cathode and anode of CR9. If U1-5 and U1-10 are positive with respect to U1-4 and U1-11, then the power supply is operating on an AC input and the AC LED signal will be high. When the AC input is removed and the battery is used to provide power, U1-5 and U1-10 will be pulled to ground, so that U1-4 and U1-11 are set high. The BATTERY LED signal will then be high.

4) SHUTDOWN: This input to the power supply is derived from the Control Board. When *SHUTDOWN = 1, relay K1 is energized and the battery is capable of providing power should the AC power to the power supply board be lost. When *SHUTDOWN = 0, the battery is disconnected. The sequence is as follows:

   a. At turn on, *SHUTDOWN goes high.
   b. With AC loss, *SHUTDOWN remains high.
   c. When the battery drops to approximately 10V, the power supply logic will cause BATTERY SENSE to go high. With BATTERY SENSE = 1, *SHUTDOWN from the Control Board goes low. This deenergizes the relay and turns off the unit.

NOTE *The above sequence is caused by a microprocessor sequence. To test the power supply logic, the sequence must be simulated by a test fixture.*

4.3.2.14 +5V Standby Circuit

The +5V standby circuit, figure 4-6, is located on the Motherboard, figure 7-14, and provides a +5V regulated voltage which is used to power RAM memory. This voltage is regulated to +5V from the battery voltage by way of a zener diode CR1 and emitter follower Q1.

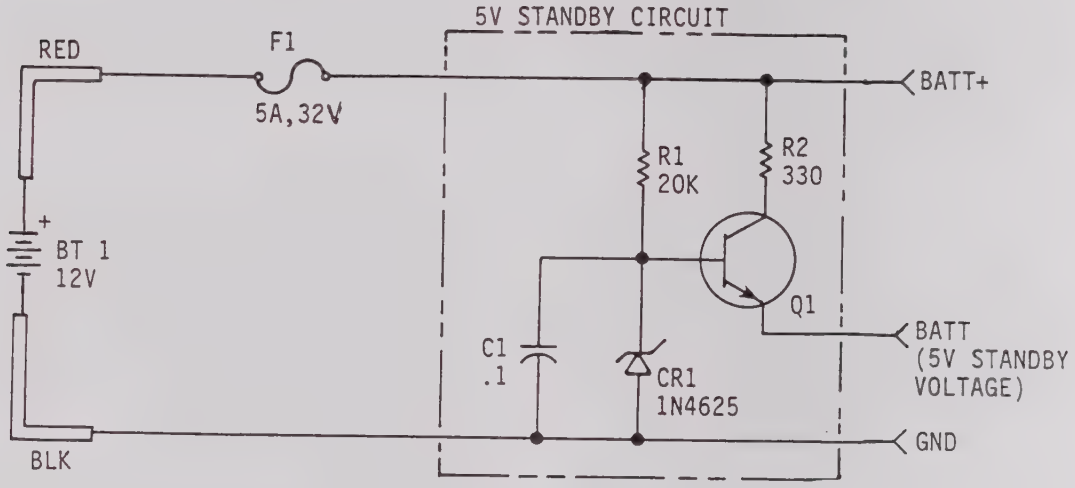


Figure 4-6. +5V Standby Circuit

4.3.2.15 Fan Operation

A brushless DC fan is used to cool the 626G enclosure. This fan is powered by a DC voltage of +15V for continuous operation. The fan's airflow is directed to blow into the power supply at a rate of approximately 13 CFM. The rated life expectancy of the fan is 60,000 hours at 25°C.

4.3.2.16 Battery Pack

The battery pack, figure 7-18, serves as back-up power for Power Supply A1. The battery is rated at 12 volts, 1.2 Amp-hours and is fused with a 5 Amp 32 volt fast-blow fuse. During battery operation, when the battery voltage drops to approximately 10 volts, the CPU on the Control Board shuts down the 626G Mainframe. After shutdown, memory may be maintained by the battery power 5V standby circuit for a period of several weeks.

NOTE *Refer to paragraph 5.7 for battery cautions.*

4.4 MAINFRAME CPU

4.4.1 Introduction

The Mainframe CPU is a single board computer which is programmed to control the operation of the Series 626G. All major components in the 626G (plug-in modules, front panel keyboard and switches, thermal printer and power supply) are connected to the control board via the motherboard (A9). Connectors for the RS-232C serial communications port, time sync, and miscellaneous options are located at the rear panel end of the Control Board.

4.4.2 Block Diagram Description (See fig 4-7.)

The Mainframe CPU circuits consist of several basic sections: CPU, real-time clock, I/O (input/output) interface, and miscellaneous. The CPU section includes an 8-bit microprocessor, EPROM, RAM, clock generator, power supply control, system reset, address decoding, control signals, and an interrupt source register. System firmware is contained in EPROM. Some of the RAM is supplied with standby battery power for non-volatile storage of setup data. The real-time clock maintains the date and time of day, and provides signals that enable two or more 626G mainframes to be synchronized. The I/O interface circuits (U32 and U53) permit communication with and control of the thermal printer, front panel switches, and the RS-232C serial interface. Miscellaneous circuits include an alarm contact relay, a time-mark input, and an isolated field contact supply (626G Mainframe Option 102).

NOTE *References to components are generally presented within parenthesis; e.g., "(U19-9)" refers to pin 9 on U19. The terms low and high, when applied to signals, refer to logic levels.*

4.4.3 Detailed Description (See fig. 7-10)

4.4.3.1 CPU: Clock Oscillator

System clock signals are derived from a 16 MHz oscillator and a divider chain. The 16 MHz oscillator is comprised of a crystal (Y1), CMOS inverters (U17) and associated passive components (R2, C1, C2, and C3). Four flip-flops (U18 and U19) constitute a divider chain, providing 8 MHz, 4MHZ and 1MHz square waves, all with 50% duty cycles. The 1 MHz clock at U19-9 is applied to the clock input of microprocessor U3.

4.4.3.2 CPU: Power Supply Control and System Reset

Refer to the following signals: ON/*OFF, *RESIN, AC LOST, BATT DEAD, *SHTDWN, *RESET, and TRISTATE on sheet 2 of the Control Board schematic (fig. 7-10). The ON/*OFF and *RESIN signals are derived from the Function key-switch; ON/*OFF is grounded when the switch is in the OFF position, and *RESIN is grounded when the switch is in the RESET position. AC LOST and BATT DEAD are signals from the Power Supply; AC LOST is low if there is no AC voltage into the supply, and the BATT DEAD signal is high if the mainframe battery is depleted. *SHTDWN is a signal from the Control Board to the Power Supply; when this signal is low, the supply is shut down, leaving a 5V standby voltage to only a few critical circuits. *RESET originates on the Control Board, and is the system reset signal used by all the plug-in modules; while this signal is low, all processing activity is suspended. The TRISTATE signal is local to the Control Board; while this signal is high, the real-time clock and the battery-backed memory are protected from access during power supply transitions from off to on and on to off.

While the Function switch is in the OFF position, TRISTATE should be high and ON/*OFF, AC LOST, and *SHTDWN should be low. If *SHTDWN is low, it will not go high until ON/*OFF and AC LOST are both high. Thus, the unit cannot be turned on without AC power. If AC power is present and the switch is turned on, *SHTDWN will go high, activating the Power Supply's battery relay closure. At the same time, C4 begins to charge towards 5V. After approximately 1/2 second, the voltage across C4 will be high enough to cause the *RESET signal to go high. Since the 5V logic supply stabilizes within about 200 mS, the *RESET signal is held low for about 300 mS after the Power Supply is stable, assuring that the microprocessor and logic circuits start up with a stable supply. When *SHTDWN and *RESET are both high, TRISTATE will go low, enabling access to the real time clock and battery-backed memory. At that time, the microprocessor is free to begin its startup routines.

While the unit is operating, the microprocessor monitors the ON/*OFF, AC LOST and BATT DEAD signals. If AC LOST goes low, a power loss is detected and the unit will switch to internal battery power operation. If BATT DEAD goes high while AC LOST is low, the unit will shut itself off by setting *SHTDWN low. If the Function switch is set to OFF, the unit will shut itself off by causing *SHTDWN to go low. The microprocessor cannot cause *SHTDWN to go low while the unit is operating with AC power available. If the Function switch is set to RESET, *RESIN will be grounded, C4 will be discharged, *RESET will go low and TRISTATE will go high. When the switch is released, *RESET will remain low for about 1/2 second, after which the microprocessor restarts as at power on.

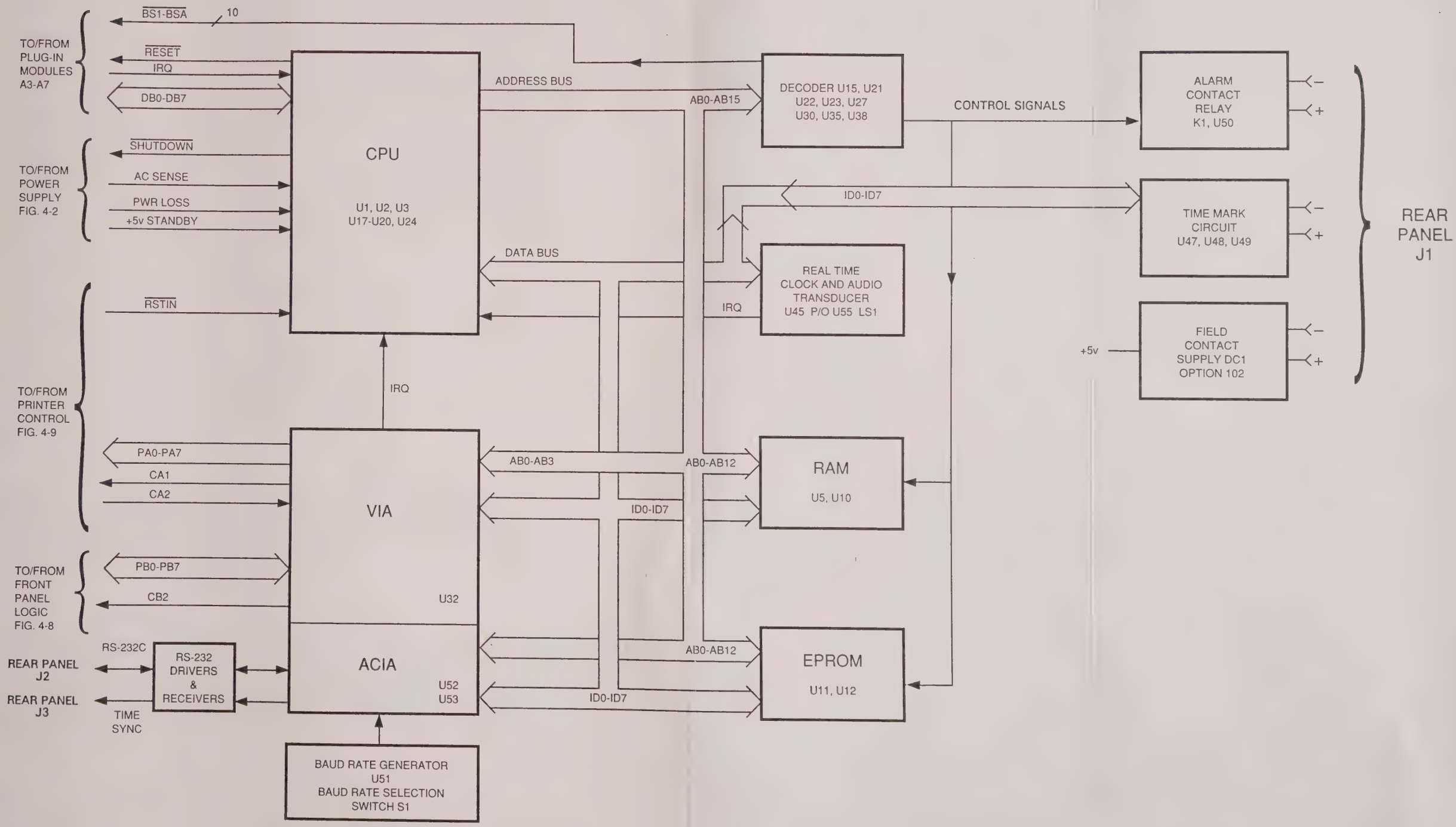


Figure 4-7. Mainframe CPU, Block Diagram

4.4.3.3 CPU: Address Decoding

NOTE *A dollar sign prefixing a number indicates hexadecimal (base 16) notation.*

Microprocessor U3 (henceforth referred to as the 6502) can address up to 64K (65,536) 8-bit bytes. Most of the address decoding is accomplished by 1-of-8 decoder ICs U21, U22, U23, U27, and U38. U21 divides the address space into eight equal blocks of 8K bytes each, and is used to decode the two EPROMs containing the firmware. U22 and U23, which divide the address space into 16 equal blocks of 4K bytes each, are used to generate the select lines (BS0 through BSB) for on-board RAM and for the five plug-ins. U27 divides the range $D800-$DFFF into eight pages of 256 bytes each. U29 and U38 generate the select lines for the peripheral ICs including the VIA (Versatile Interface Adapter), ACIA (Asynchronous Communications Interface Adapter) and real time clock. All addresses for peripherals are confined to two pages, one at $8D00-$D8FF and the other at $DC00-$DCFF. U30 and U15 ensure that EPROMs U11 and U12 are deselected during accesses to peripherals. The result is that the firmware occupies the address range $C000-$FFFF except for the two pages used for peripherals.

The real time clock (U45), henceforth referred to as the 6818, is decoded somewhat differently than implied by the data sheet for the device. The 6818 is intended for use with microprocessors (such as the 6805 series) having a multiplexed address/data bus with address and data strobe signals. With such a multiplexed bus, the 6818 appears as 64 contiguous registers, accessed with one read or write instruction. Since the 6502 does not have a multiplexed address/data bus, a different technique was used. In this application, the 6818 appears as two memory locations: an address register and a data register. Accessing the 6818 requires two instructions: write the address of the desired 6818 register to the address register, then read or write the data using the data register.

4.4.3.4 CPU Control Signals

All memory accesses are reference to the Phase 2 clock output from the 6502 (U3-39). During a write, data from the 6502 is valid while Phase 2 is high. During a read, the 6502 latches the data during the high-to-low transition of Phase 2. The *MYR (MemorY Read) and *MYW (MemorY Write) signals are derived from Phase 2 and R/*W (Read/Write); *MYR is low while Phase 2 and R/*W are high, and *MYW is low while Phase 2 is high and R/*W is low.

4.5.3.5 CPU: Interrupts

The 626G firmware permits interrupts only while the unit is in the Operate mode. While in this mode, interrupts are accepted from three sources: the 6818 real time IC (U45), the versatile interface adapter (VIA, U32) and any of the five plug-ins. When an interrupt occurs from any of the sources, the interrupt source register (U33) is read to determine the source. If more than one interrupt request is pending, they will all be serviced in order of priority. The 6818 has the highest priority, followed by the VIA, then plug-in channels 5 through 1.

4.4.3.6 Real Time Clock: 6818 Operation

The 6818 (U45) and the internal timer of the VIA (U32) are used together to enable the 626G to record disturbances with 10 mS time resolution. The current date (month, day and year) and the current time (hour, minute, second) are stored in the 6818 and updated once per second, even while the 626G is off. While in the Operate mode, the 6818 generates an interrupt once per second, with the following results: the current time and date are read from the IC and saved in memory; the 10-millisecond interval counter (upon which the 10 mS event resolution is based) is set to zero and resynchronized; if the time is midnight, a flag is set so that the Daily Summary message will be printed.

4.4.3.7 Real Time Clock: VIA Operation

The internal timer of the VIA (U32) is set to generate interrupts at 10 mS intervals. Most of the processing concerning time is performed while this interrupt occurs: a counter is incremented, indicating time to the nearest hundredth of a second, the value of this counter is saved on the event stack along with the time of day read from the 6818, a time-mark input is recognized if present and each plug-in is given a chance to perform a quick routine for its own purposes.

4.4.3.8 Real Time Clock: Time Synchronization

The 626G provides a time synchronization feature (time-sync from now on), allowing multiple 626Gs to be connected so that the disturbances recorded on one Mainframe can be time-correlated (to within 30 mS) to those recorded on other Mainframes. This is accomplished by providing a separate communications interface (independent of the standard RS-232 interface), dedicated to sending and receiving characters representing time data. The master unit transmits a stream of characters, once per minute, representing time data: year, month, day, hour, and minute. The slave unit resets its clock according to the received data. A 626G can be both master and slave, depending on connections made to the time sync interface. Time data is always transmitted whether or not it is received, and valid time data is always used if received.

The time-sync interface is similar to a minimal RS-232C implementation; cabling requirements are non-standard, and no handshaking is used. The baud rate is fixed at 9600, but the time interval between characters is 1 second. The 626G transmits one character every second; since only 16 characters are used for actual time data, carriage return characters will be sent as padding. The transmission of each character is timed so that it is sent 1/2 second after the last interrupt from the master's 6818. The result is that the complete data stream is received from the slave exactly 1/2 second before the next minute transition will occur on the master. Once the last character in the steam is received, the slave immediately sets its own clock according to the master's time, with seconds set to 59. The 6818 will update the time exactly 1/2 second later, and the master and slave clocks will agree to within 20 mS (The 30 mS specification includes the 10mS uncertainty for any disturbance recorded by the 626G.)

4.4.3.9 Real Time Clock: Time-Sync Character Stream

Table 4-1 describes the format of the time-sync character stream. All characters are "printable" in that a terminal may be used to observe them for purposes of troubleshooting. For example, the stream indicating 5 minutes past midnight, January 1, 1991 would appear on the terminal as:

>91 01 01 00 05r

The letter r represents a checksum. The checksum, sent as one ASCII character, is generated as follows:

1) Initialize the checksum byte to zero
2) One at a time, add all the ASCII character values (not the time values represented by the characters) sent in the stream, starting with the ">" and ending with the minute ones digit. The result should be a 1-byte value (ignore overflows.)
3) Clear bit 7 and set bit 6 of the result.

TABLE 4-1

Time-Sync Character Stream Format

Second#	Character Sent
00-43	CHARACTER RETURN (hex $0D)
44	> ("greater than" symbol)
45	<Year - tens digit>
46	<Year - ones digit>
47	SPACE
48	<Month - tens digit>
49	<Month - ones digit>
50	SPACE
51	<Day - tens digit>
52	<Day - ones digit>
53	SPACE
54	<HOUR - tens digit>
55	<Hour - ones digit>
56	SPACE
57	<Minute - tens digit>
58	<Minute - ones digit>
59	<checksum>

4.4.3.10 I/O Interface

The I/O Interface section includes circuits to implement an RS-232C serial communications interface, and to control the thermal printer, keyboard, and LEDs. VIA U32 is used to control the printer, keyboard, and LEDs by manipulating its various I/O and handshake lines. (Descriptions of printer/keyboard/LED operation are contained in paragraphs 4.5, 4.7 and 4.8 of this manual.)

The RS-232C interface consists of ACIA U52, baud rate generator U51, and RS-232C compatible line drivers and receivers (U54, U55, U56, and U57). During power-up, the 6502 reads the baud rate selector switch (S1) and sets the baud rate generator accordingly. Pins 4 and 20 of J2 (the 25-pin "D" connector) are monitored by the 6502 to determine the status of the port. If these signals are both active (approx.+12VDC), the RS-232C port will be enabled. Once the port is enabled, transmission of characters from the 626G may be suspended by causing pins 4 and 20 of J2 to become inactive (approx-12VDC); however, the port will be disabled if these signals are inactive longer than 0.24 seconds.

In a case where the data output cannot keep up with the data input, the stack will overflow. While the stack is full, the worst case data are sent to the Short-Term Accumulator, along with the total number of "hits" (disturbance occurrences) recorded. Whenever the Short-Term Accumulator data is printed, the data is then cleared from memory.

The 626G Control Board internal event stack is 256 bytes long. The minimum event size is 4 bytes per event. If time is required to be stored another 4 bytes is required per each 10 msec time period. If all events occur within a 10 msec interval then the MAX number of events could be

$$\frac{\text{256 bytes - 4 bytes for time}}{\text{4 bytes/event}} = 63 \text{ events}$$

The internal stack is capable of handling 32 disturbances, more (up to 63), if multiple disturbances occur in a single time frame (10 msec).

4.4.3.11 Audio Transducer

The audio transducer is used both as an alarm and to generate a "click" sound whenever one of the front panel keys is depressed. The transducer is turned on and off under software control by enabling and disabling the square wave output for real time IC U45. When the square wave is enabled, it is set for a frequency of 1024 Hz. The square wave appears at pin 23 of U45, goes through a tri-state buffer (U13), and is sent to a spare RS-232 driver (U54) which drives the transducer.

4.4.3.12 Time-Mark Input

The optically isolated time-mark input allows an external event to be time-correlated with other disturbances detected by the instrument. A DC voltage of 5 volts (nominal) applied to the time-mark input (pins 8 and 3 of J1) will cause the output of optocoupler U49 to go low, causing the Q (pin 9) output to latch U47 to go high. This signal is sampled every 10 mS by reading buffer U48. The latch is reset with a write instruction, causing a low pulse to appear at the clock input of latch U47. Each time a 5 to 12VDC level is applied to these inputs, a "#" symbol, followed by the present time, is printed out by the thermal printer.

4.4.3.13 Alarm Contact Relay

Relay K1 is closed every time certain types of disturbances are detected (this is plug-in dependent). A microprocessor write to the appropriate address will cause a low pulse to be applied to pin 6 of timer U50, which keeps the relay closed for 1 second. The time constant is determined by R30 and capacitors C14 and C15.

4.4.3.14 Field Contact Supply - (Option 102)

The field contact supply provides an isolated 5V DC supply for use with the alarm contact relay and/or certain plug-ins. DC1 is a prepackaged DC-to-DC converter. R24 is a current limit resistor; the other components (L1, and C27-C30) are used for filtering.

4.5 FRONT PANEL LOGIC

4.5.1 Block Diagram Description (figure 4-8)

The Front Panel Logic enables the front panel controls and indicators to interface with the Mainframe CPU. Control signals going to the two keyswitches (S1 and S2), the upper and lower keyboards, the keyboard LED's (DS1-DS10) and the paper low switch enter on lines PB3-PB7. These signals are decoded by the switch decode hardware and also by the LED drivers. Signals that are coming from the upper and lower keyboards, the two keyswitches and the paper low switch are encoded by the hardware and then read by the Control Board as a 3-bit code on lines PB0-PB2.

*SWRESET originates at front panel keyswitch S2 and is sent directly to the Printer Control PCB.

4.5.2 Detailed Description (figure 7-12)

4.5.2.1 Switch Decode Hardware

Connector J13 on the Keyboard Logic Board (A8) is connected by the Versatile Interface Adapter (VIA) to the CPU on the Control Board (A2). Via a 4-bit code applied to decoders U6 and U7 from inputs PB4-PB7 (PB7 is the chip enable signal), the mainframe processor monitors each switch group, in turn, by setting its bank line low via buffers U4 and U5.

Lines A through N from the five switch groups (S1, S2, upper and lower keyboards and the paper low switch) are applied to priority encoders U1 and U2 which encode both 8-bit inputs into 3-bit outputs. If more than one switch is depressed at once, the highest priority signal takes precedence and is accepted. The codes are then buffered by U3 and read by the CPU on lines PB0-PB2. Input PB7 is used to select either U1 or U2.

EXAMPLE: To determine the status of the LO LIMIT switch (S21) on the keyboard (fig. 7-4), the processor sets the bank 1 line low via the appropriate bank 1 3-bit code fed to U7, then reads the 3-bit code from encoder U1 via buffer U3.

TABLE 4-2

Lower Keyboard Switch/Pin Identifier

Color	Function	Switch No.	Bank (Pin #)	Line (Pin #)
Y	0	8	4 (2)	K (10U)
Y	1	11	3 (3)	I (8U)
Y	2	7	3 (3)	J (9U)
Y	3	3	3 (3)	K (10U)
Y	4	10	3 (3)	L (6L)
Y	5	6	3 (3)	M (4L)
Y	6	2	3 (3)	N (9L)
Y	7	9	4 (2)	H (7U)
Y	8	5	4 (2)	I (8U)
Y	9	1	4 (2)	J (9U)
Y	. :	4	4 (2)	L (6L)
Y	CLEAR ENTRY	12	3 (3)	H (7U)
R	blank	14	2 (7)	K (10U)
R	blank	15	2 (7)	J (9U)
R	blank	16	2 (7)	I (8U)
R	blank	19	1 (8)	M (4L)
R	blank	20	1 (8)	L (6L)
R	blank	27	0 (10)	I (8U)
R	BURST SENS	18	1 (8)	N (9L)
R	F SENS	23	1 (8)	I (8U)
R	FNC	24	1 (8)	H (7U)
R	HI LIMIT	17	2 (7)	H (7U)
R	IMP SENS	22	1 (8)	J (9U)
R	INPUT	26	0 (10)	J (9U)
R	LO LIMIT	21	1 (8)	K (10U)
R	RANGE	25	0 (10)	K (10U)
R	SENS	13	2 (7)	L (6L)
G	ENTER	28	0 (10)	H (7U)
B	CLOCK	34	A (5)	A (6U)
B	1	33	A (5)	B (5U)
B	2	32	A (5)	C (4U)
B	3	31	A (5)	D (3U)
B	4	40	A (5)	E (2U)
B	5	41	A (5)	F (1U)

KEY: Y = Yellow
R = Red
G = Green
B = Black

U = Upper Circuit
L = Lower Circuit
All bank pin numbers are on the lower circuit

Note: Pressing switch (No.) closes Bank (Pin #)/Line (Pin #) circuit at plug.

A scanning technique is used to store the 3-bit switch status words in RAM. This enables the Mainframe CPU to scan its RAM to determine the last key pushed.

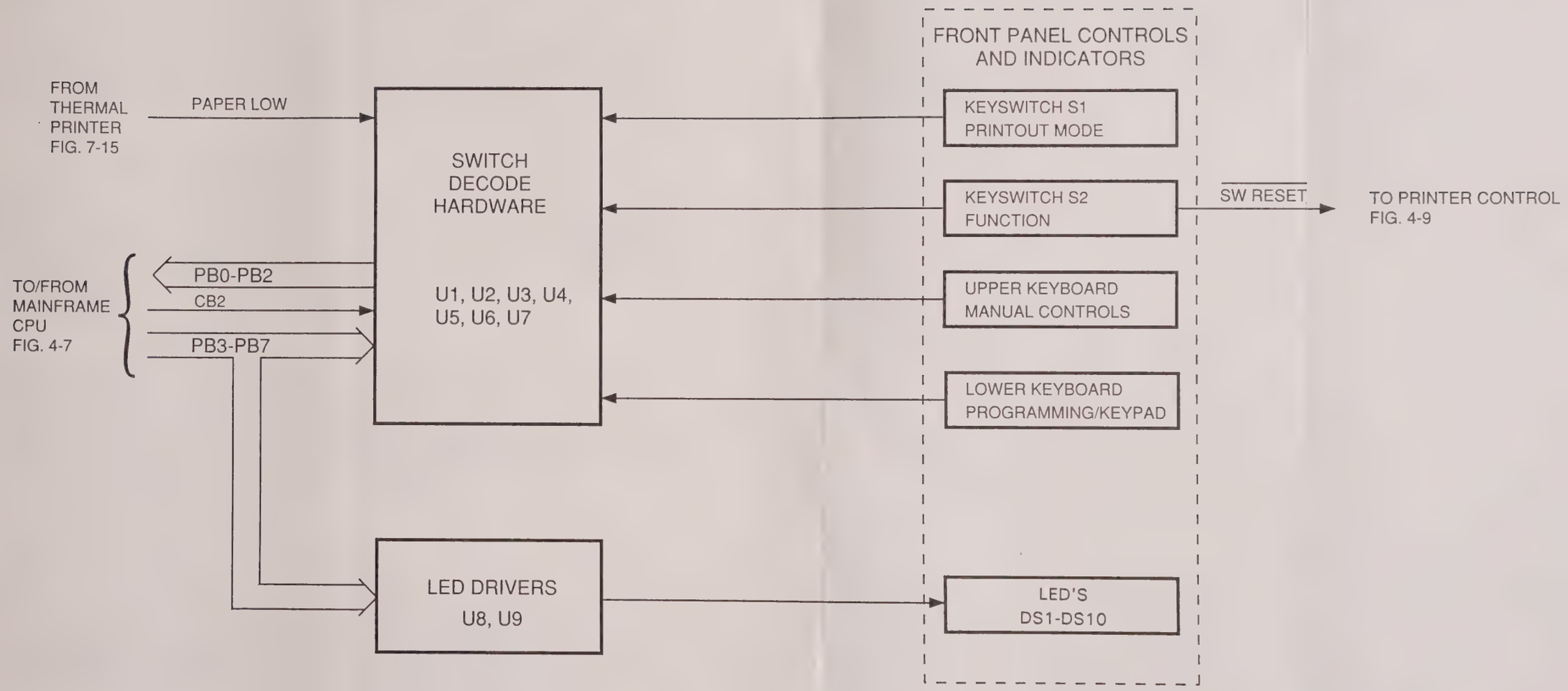


Figure 4-8. Front Panel Logic, Block Diagram

4.5.2.2 LED Hardware

LEDs DS1-DS10 on the keyboard are activated by the mainframe processor in proper sequence to guide the operator through the operator sequence. To turn on the lamps, encoded 3-bit signals are applied to addressable peripheral drivers U8 and U9 via lines PB4-PB6. Resistor network RN1 and resistors R1 and R2 limit the current drawn from the LEDs.

4.6 MOTHERBOARD

The motherboard, figure 7-14, provides a path for all signals coming to and from the control board. It has room for five plug-in boards and holds the circuitry for the +5v standby (see paragraph 4.3.2.14) and the power indicator (see paragraph 4.3.2.13, signal 3) circuits.

4.7 THERMAL PRINTER

The printer, figure 7-15, is a continuous line dot matrix printer that can print up to 160 dots across the width of the thermal paper tape. The printhead is divided into 20 segments. Each segment contains a resistor/diode matrix capable of burning 8 dots. Printhead data is transmitted such that only one dot per segment can be burned at once. This limits the current drawn by the printer. A detailed description of the printer drivers can be found in paragraph 4.8.2.3.

4.7.1 Paper Low Switch

The printer paper low switch is connected at J7-1 and J7-2 on the Keyboard Logic Board (A8). The paper low switch is normally open when the printer has an ample supply of paper. Upon a paper low condition, this switch closes and generates a signal which is decoded by the keyboard logic (see paragraph 4.5.2.1). To remedy a paper low condition replacement of the printer paper roll is necessary. Instructions for changing the paper roll are printed on the front panel behind the printer tape. While the mainframe is in a paper low condition, "SUMMARY ONLY" data will be printed.

4.8 PRINTER CONTROL

4.8.1 Block Diagram Description (figure 4-9)

The Printer Control receives data from the Mainframe CPU on lines PA0-PA7. The transmitted data is in either ASCII format, for alphanumeric characters, or Epson bit map format, for graphics characters. "Data Taken" and "Data Ready" are handshake lines used to control the flow of data between the Control Board and the Printer Control Board.

The CPU (U39) takes in data through the input buffer and the data bus buffer and reformats it into a form that is usable to the printer. The program code that the CPU uses is contained on the EPROM (U43). Once the data has been reformatted it is outputted through the data bus buffer to Latches (U32, U33 and U34).

When the data is ready to be printed control signals activate the latches and send it to the printhead drivers (U31, U36, U37 and U38). When one line of dots is printed, data is clocked into latch U29 in order to activate the motor driver (U28). This drives the stepper and take up motors so that the next line of data can be printed.

4.8.2 Detailed Description (figure 7-17.)

4.8.2.1 Input Buffer

The CPU of the mainframe's Control Board transmits data to microprocessor U39 on the Printer Control Board via data lines PA0 through PA7 and buffers U26 and U18. Signals CA1 and CA2 are used as handshake lines ,"DATA TAKEN" and "DATA READY" respectively, to allow buffer U26 to receive data from the mainframe Control Board's CPU

The handshake lines are defined as follows:

1) Idle States:

"DATA TAKEN" line from Printer Control Board (A11) held at logic 1 (high).
"DATA READY" line from Control Board (A2) held at logic 1 (high).

2) Data Transfer between Control Board (A2) and Printer Control Board (A11):

A2 waits until "DATA READY" is high
A2 sets up character to data lines PA0-PA7
A2 sets "DATA READY" line low.
A2 waits for "DATA TAKEN" line to go low
A11 sees low on "DATA READY" and reads data lines PA0-PA7
A11 sets "DATA TAKEN" line low
A11 waits until "DATA READY" line is high
A2 sees low on "DATA TAKEN"
A2 sets "DATA READY" line high
A2 now knows that the character is accepted
A11 may now process the character
A11 sets the "DATA TAKEN" line high when ready to accept another character

4.8.2.2 CPU Memory Allocation

The CPU can address 64Kbytes of space The memory allocation is as follows:

OOOO to 7FFF: 32Kbytes of address space from is unused except for addresses 1000-103F (64 bytes) which are used for the CPU's internal registers (see Table 4-3).

8OOO to 9FFF: 8Kbytes of space (PRAM) for microprocessor and bit map RAM storage. The CPU's internal 256 bytes of RAM is remapped here The remainder of the PRAM is used for bit mapping for graphics printouts.

AOOO to BFF7: Program code which is contained in the EPROM (U43).

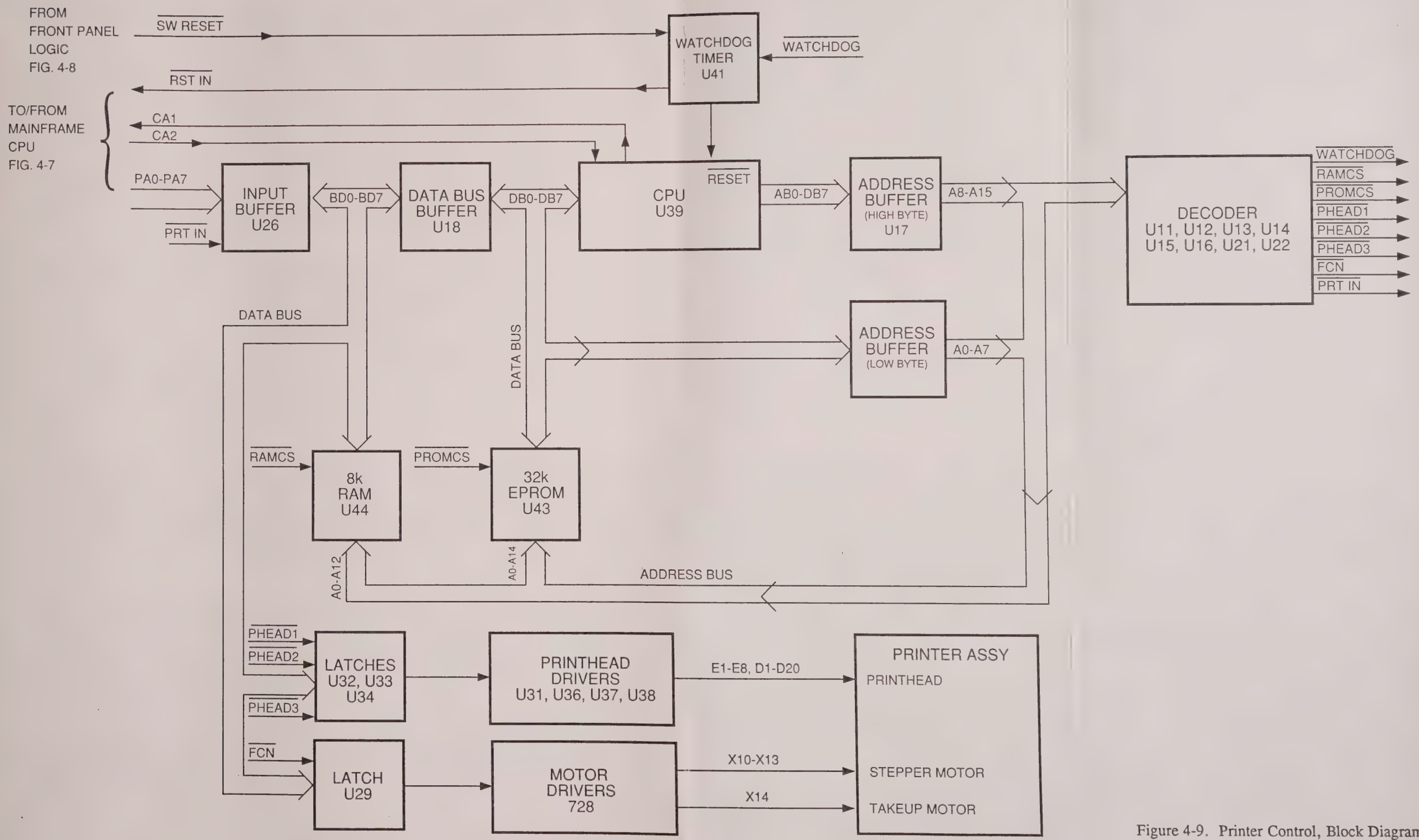


Figure 4-9. Printer Control, Block Diagram

BFF8 to BFFF: Hardware external to the microprocessor. The addresses allocated to hardware are defined in the READ and WRITE INSTRUCTION TABLES. (Found under Decoding Logic Subsection.)

COOO to FFFF: Program code which is contained in the EPROM (U43).

TABLE 4-3

68HC11 Internal Registers, Ports, etc.

1000	Port A	PA1, 2, 7 0 PA0 JUMPERED to GND, optional +5 PA3 Output *enable to VIA port PA4 Output enable to BFFA Decoder
1003	Port C	multiplexed D0-7, A0-7
1004	Port B	Address bus A8-A15
1008	Port D	PD5 CA2 Data Ready PD4 CA1 Data Taken, Busy PD0-Revdata on serial port PDI-XMT data of serial port
102C,D	Serial Port	Setup to 1 start, 8 data, 1 stop
102B	Baud Rate	9600
1039	Watchdog	427 msec

4.8.2.3 Printer Drivers

The thermal printhead contains a 20-character by 8 dot resistor/diode matrix. The 8 dot input is derived from U30 decoding pins 2, 5 and 6 of U34. Darlington array U31 and MOSFETS Q1 through Q8 provide the drive stage for dots E1 through E8 of the printhead. Use of decoder U30 guarantees that only one segment of E1 through E8 is energized at one time. The digit position to be printed (D1-D20) is chosen through latches U32, U33 and part of U34 (pins 12, 15, 16, and 19). The output of U34 pin 9 is used to enable decoder U30 Disabling U34 pin 9 (setting the output low) thus disables the printhead drive circuitry.

A timing sequence, controlled by U39, is used to print each line of dots: the dot pattern for the first horizontal position (D1) is timed out, U39 removes drive from the eight dot lines (E1-E8) controlled by U34, turns on the proper dot drive for the next horizontal position (D2), times out this position, removes dot drive, and so forth, moving in sequence through all 20 positions. If nothing is to be printed in a particular position, U39 skips the timing cycle and sequences to the next horizontal position. When the first full row of dot patterns has been printed, it represents the leading or top edge (first of seven vertical dot positions) of an entire line of printed characters.

After a full horizontal pattern has been printed, motor driver U28 is activated by clocking data into latch U29 pins 2, 5, 6, 9 (1Q-4Q). The output of U28 pins 4-6 steps the motor to a new vertical position, after which, the next horizontal dot pattern is printed. After seven lines are printed, a full row of complete characters, each formed by a 5-by-7 dot matrix, appears on the printer tape.

The take-up motor is energized by U28 pin 12 driving Q9 (on the Keyboard Logic Board). The drain of Q9 draws current through the take-up motor. Diode CR1 is used to clamp the take-up winding at turn-off. The take-up and stepper motors are energized together so that the paper take-up functions during printing and paper feeds.

When power is initially applied, the stepper motor is energized, forcing some blank paper out of the printer. This indicates to the user that the equipment is operational.

4.8.2.4 Decoder

Addresses beginning with "AB" are unbuffered address lines. Addresses beginning with "A" are buffered address lines. IC U17 is used to buffer the high byte of the address bus and IC U19 buffers the low byte. The low byte of the address bus is multiplexed on the data bus. Inverters U21A-U21C are used to provide *A13, *A14, *A15 undelayed from addresses A13, A14, A15, keeping timing waveforms synchronized on these address lines.

The hardware signal *PROMCS is decoded by U11D and is used to enable EPROM U43. Bits A15, and A14 are decoded for addresses COOO-FFFF by U11A. U13A, U13B and U14 decode addresses AOOO-BFF7.

Hardware addresses BFF8-BFFF are decoded by U14. Decoder U15 is used to decode addresses for read instructions (see Table 4-4) and decoder U16 is used to decode addresses for write instructions (see Table 4-5).

Address bits *A15, *A14, *A13 are decoded by U13C, U22A, U12B to select addresses 8OOO-9FFF using the signal *RAMCS. These addresses are locations in PRAM (U44).

U20, U21E, U21F are used to buffer the Enable and Read/*Write signals: "BE" is buffered Enable, "BR/*W" is buffered Read/*Write. All data, address, enable and read/write signals remain synchronized because they are buffered. This keeps gate delays to a minimum. Gate delay is less than 33nsec because the buffered enable signal "BE" and the decoded addresses are sent through a single gate. This keeps the address hold time, following the falling edge to the enable waveform, valid.

The data bus buffer (U18) and the EPROM (U43) are never enabled at the same time.

Table 4-4	
68HC11 READ INSTRUCTIONS	
Address	Instruction Explanation
BFF8	Address unassigned
BFF9	Address unassigned
BFFS	Address unassigned
BFFB	Address unassigned
BFFC	*PRTIN: Enable for buffer U26 to receive data on interface bus
BFFD	Address unassigned
BFFE	Address unassigned
BFFF	Address unassigned

Table 4-5	
68HC11 WRITE INSTRUCTIONS	
Address	Instruction: Explanation
BFF8	*PHEAD1: Printhead columns D1 through D8
BFF9	*PHEAD2: Printhead columns D9 through D16
BFFA	*PHEAD3: Printhead columns D17 through D20; Output decoded for character/dots E1-E8.
BFFB	*FCN: Latch controlling stepper motor and take-up motor.
BFFC	Address unassigned
BFFD	*WATCHDOG: Strobe input for watchdog timer U41.
BFFE	Address unassigned
BFFF	Address unassigned

4.8.2.5 Watchdog Timer

The reset for Microprocessor U39 is controlled by watchdog timer U41. Upon power-up of the 626G mainframe, the RST and *RST pins (pins 5 and 6) are kept active for a minimum of 250ms to allow the power supply and processor to stabilize. Once the power-on reset is completed, U41 continues to monitor the voltage at pin 3 (TOL). If the voltage at pin 3 falls below 4.5 volts, the reset signals would again become active, causing an active reset for 250msc.

The operator can choose to reset the 626G mainframe upon demand by using the left front panel keyswitch. Turning the key to the extreme right causes U41 pin 1 to be pulled low. This would cause an active reset at U41 pins 5 and 6.

The reset signal from U41 pin 6 is also sent to reset the Control Board's CPU via connector J9, pin 12.

A watchdog timer is contained internally in microprocessor U39, as well as externally by U41. A hardware location has been set up for both internal and external watchdog timers to which microprocessor U39 writes, allowing monitoring of the CPU's (U39's) functioning. This protects microprocessor U39 from lock-up, thus preventing a condition with the printhead continuously energized. If the front panel CPU failed to write to the watchdog timers an active reset would occur of 500msec duration. The watchdog timer reset duration is controlled by U41 pin 2 (TD input).

4.8.2.6 EPROM

All program code for running microprocessor U39 and related circuity is contained in U43. U43 is a 32K byte EPROM. For the 626G's operation, 24K bytes of address space have been allocated for program code. The remaining 8k is unused.

4.9 PLUG-IN MODULES

The 626G Mainframe can hold up to five single board plug-in modules. The following table provides a list of the avalable plug-ins along with their specifications and applications.

Table 4-6. Optional Plug-In Modules

Function	Part Number	Sensor Type	Phase	Ch.	Ranges	Peak Values	Options	Uses & Applications
Single Phase Voltage & Current Graphics	626-PA-6031	AC	1	3	47-63 Hz	250, 500, 1000 Vpk graph	N/A	Complete Branch Circuit Analysis L-N, N-G, current
3 Phase/ 50/60 Hz. Voltage Graphics	626-PA-6030	AC	3	3	50/60 Hz	250, 500, 1000 Vpk graph	N/A	Impulse, sags, surges over/under voltage, & frequency change
3 Phase/ 400 Hz. Voltage Graphics	626-PA-6040	AC	3	3	370-450 Hz	250, 500, 1000 Vpk graph	N/A	Impulse, sags, surges over/under voltage, & frequency change
Current Monitor	626-PA-6005A	AC	1	1	45-450 Hz	2000 Apk 300 Arms	N/A	Inrush Current True RMS
N-G Voltage Monitor	626-PA-6006A	AC	1	1	50/60 Hz	50 Vpk	Impulse Direction Impulse Strength	Common Mode Impulses Determine impulse direction
Single Phase Voltage Monitor	626-PA-6001	AC	1	1	50/60 Hz 50-600 VAC	600 Vrms 4000 Vpk	Impulse Duration (101) Strength (102) Impulse Direction	Impulse, sags, surges over/under voltage, & frequency change Determine impulse direction
3 Phase 50/60 Hz Voltage Monitor	626-PA-6003	AC	3	3	50/60 Hz	600 Vrms 4000 Vpk	N/A	Impulse, sags, surges over/under voltage, & frequency change
3 Phase 400 Hz Voltage Monitor	626-PA-6009	AC	3	3	370-450 Hz	600 Vrms 4000 Vpk	N/A	Impulse, sags, surges over/under voltage, & frequency change
Harmonic Voltage Monitor	626-PA-6024A	AC	3	3	47-63 Hz	600 Vrms	N/A	Monitor Voltage Harmonic Distortion
Harmonic Current Monitor	626-PA-6024B	AC	3	3	47-63 Hz	300 Arms	N/A	Monitor Current Harmonic Distortion
Power Demand Monitor	626-PA-6025A	AC	3	3	45-400 Hz 90-600 Vrms 0.5-5 Arms	600 Vrms	N/A	Monitor Power Consumption
Impulse Energy Monitor	626-PA-6018	AC	1	1	45-450 HZ	4000 Vpk 2000 Apk	N/A	Monitor impulses & impulse energy
Low Range Voltage/Transducer Monitor	626-PA-6015	DC	N/A	3	0-10 VDC	10 VDC	N/A	DC Voltage or Transducer output, Programmable Eng. Scale Factors
Low Range Voltage Monitor	626-PA-6002A	DC	1	1	0.5-80 VDC	80 VDC	Impulse Duration (101) Strength (102)	DC Monitoring: logic levels, power supplies, etc.
High Range Voltage Monitor	626-PA-6002C	DC	1	1	50-600 VDC	600 VDC	N/A	DC Monitoring
Event Monitor	626-PA-6007	DC	N/A	8	N/A	N/A	Dry Contacts (102)	Alarm (ON/OFF) Signals
Event Time Accumulator	626-PA-6011	DC	N/A	8	N/A	N/A	Dry Contacts (102)	Accumulates On/Off time per day
Broadband RF Monitor	626-PA-6020	RF	N/A	1	1MHz-1GHz	1 µsec	N/A	Continuous wave or Burst RFI Peak Electnc Field Strength Duration Omnidirectional Antenna
Temp./ Humidity Monitor	626-PA-6008	Temp /RH	N/A	2	0-100°C	N/A	Ext. Cables	Air Conditioner Performance Daily Summary
Temp Gradient Monitor	626-PA-6014	Temp	N/A	8	-50-150°C	N/A	Ext. Cables	Air Distribution Monitoring

SECTION V

MAINTENANCE

5.1 SCOPE

This section contains procedures and data that will help ensure continuity of service of the Analyzer Mainframe. Test and calibration procedures are provided for all major Analyzer functions. Test equipment designed for field service testing of the Analyzer is described and step-by-step instructions are presented for their use.

5.2 TEST EQUIPMENT REQUIRED

Table 5-1 lists of test equipment required for maintenance of the Mainframe.

Table 5-1. Test Equipment Required

Item	Characteristics	Model or Equivalent
DC Voltmeter	Range 1V to 100V Accuracy : ±0.5%	Fluke 8000A
Signal Power Source*	Sinewave Voltage, 115V Nominal Stability ±1V Max. Frequency 60.0 Hz ± 0.1 Hz 50 Hz, if this is the desired calibration frequency.	As required*
Frequency Counter	Frequency Range: 10 Hz - 80 MHz Resolution: 10 Hz, 1Hz and 0.1 Hz Accuracy: ± 1 count ± timebase error	Philips PM 6612

*The power source should not itself create an excessive amount of disturbances. This would complicate the procedures and TM-limit calibration accuracy. Normally a good 'branch circuit' that does not have abnormal load changes or voltage fluctuations is suitable. In some cases, a laboratory AC power supply may be required for calibration.

5.3 EXTENDER CARDS REQUIRED

Extender Cards 1) and 2) are required to perform the troubleshooting and calibration procedures that are described in sections 5.8 and 5.9. Refer to Section 6-3 for ordering information.

1) Extender Card (Dranetz P/N 112152). This card permits the Control Board to be operated outside the card rack, facilitating calibration and troubleshooting.

2) Extender Card (Dranetz P/N 110260). This card permits the power supply board and the plug-in cards to be operated outside the card rack, facilitating calibration and troubleshooting.

3) Extender Card (Dranetz P/N 114370-G1). This board permits troubleshooting of the Printer Control Board A11.

5.4 SERVICING CAUTIONS AND WARNINGS

WARNING

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING UNLESS YOU ARE QUALIFIED TO DO SO.

READ INSTRUCTIONS CAREFULLY

5.5 HANDLING PRECAUTIONS

5.5.1 Handling Circuit Boards and Integrated Circuits

The integrated circuits used in the Analyzer are predominantly Metal Oxide Semiconductors (MOS). These circuits are susceptible to damage by static electricity, but can easily and safely handled by taking some simple precautions.

The predominant source of potential damage is the build-up of a static charge on the person or clothing worn by the person handling the devices or boards. This normally is the voltage difference between this person and earth ground or a static charge of the unit itself. This charge can readily be several thousand volts. Low humidity conditions increase static charges substantially.

5.5.2 Grounding

It is recommended that a separate ground wire be used to connect the frame of the unit to a reliable ground within the working area. Metallic benches should be reliably grounded. A soldering iron (if used) should be a grounded (3-wire) type. A piece of conductive material which also is connected to ground should be available on which circuit boards or integrated circuits can be placed. Conductive rubber or foam is recommended, but a piece of uninsulated metallic plate is suitable.

5.5.3 Clothing

Nylon, wool, and polyester clothing can cause a considerable build-up of static electricity. It is recommended that a cotton smock be worn if available. Also, do not work in an area with a carpeted floor.

5.5.4 Board Handling

Before touching circuit boards, discharge your body first by touching the grounded surface to which the board is connected, such as the unit frame if in the unit or a conductive material as referred to in paragraph 5.5.2. When grasping or handling a board, identify the wide circuit tracks along the sides of the boards. Grasp the board with at least one finger touching one of these tracks. Never grasp or hold the board by the contact fingers. Touch the frame of the unit first with your other hand before inserting cards. When laying a board down, always touch the conductive surface with your hand first, then set the board on the conductive material.

Never a lay a board on your clothing or static-prone material. Replacement boards are, if required supplied in a conductive container with a shorting block across its finger contacts. Always keep these materials for safe handling and shipping of spare or replacement boardsIf these materials are not available, wrap boards containing MOS integrated circuits with household aluminum foil for storage or shipping. Do not insert an unprotected board into an ordinary plastic bag or loose-packed with foam chips.

5.5.5 Handling MOS Integrated Circuits

Discharge your body before touching an integrated circuit (IC). Remove all power sources to the unit before removing or inserting any integrated circuits. To remove an IC from a socket, first place the board on the conductive surface, then hold the board down with one hand, allowing at least one finger to touch the conductive surface or power supply tracks. Now remove the IC with the other hand. An IC extractor tool or small prying tool, placed between the socket and IC body to lift it, may be required. When removed, place the IC down with its pins in contact with the grounded surface. To pick up an IC, first discharge yourself by contacting the conductive surface with your hand, then pick up the IC by holding as many pins as possible.

Never lay a MOS IC on your clothing or a static-prone material. Replacement IC's, if required, are shipped in a conductive carrier or conductive foam material. Always keep these for safe handling or storing. If a suitable carrier is not available, wrap the IC in household aluminum foil. Do not place unprotected MOS IC's in an ordinary plastic bag or other static-prone material. If handing an MOS IC to another person, make body contact first.

If a MOS IC accidently falls on a static-prone surface, first locate the ground pin of the IC. Touch this pin first, then pick up the IC. If an MOS IC has been mishandled, it is recommended that it be tested before using.

5.6 GENERAL PRECAUTIONS

Observe the following general precautions:

1) Do not attempt to remove any plug-in without first disconnecting all power and signal sources and turning the unit off.

2) USE CAUTION when handling plug-ins out of the unit.

3) Disconnect all external power sources when removing or inserting any cards or integrated circuits.

4) Do not operate Mainframe with any of its circuit cards (A1, A2, or A8) or integrated circuits removed unless specifically instructed to do so.

5) For continued fire hazard protection, replace fuses only with the recommended types and ratings.

6) The fuses provided are intended for fire hazard protectionIf a fuse is open, it normally would be caused by a component failure, in which case servicing by qualified personnel is required.

5.7 BATTERY CAUTIONS

1) Batteries contained within the unit are sealed rechargeable nickle-cadmium types. Do not attempt to replace individual batteries or substitute other battery types. Replace batteries only with a complete recommended battery pack.

2) Do not intentionally short circuit the Battery Pack. The batteries are capable of providing hazardous output currents if short circuited.

3) The Analyzer is equipped with an internal battery charger circuit. Do not attempt to charge the batteries with an external charger since improper charging could cause battery explosion, producing personal injury and or/damage.

4) The batteries have a safety pressure vent to prevent excessive gas build-up. A defective charger, excessive temperature, excessive discharge rate or a defective cell can cause venting to occur. Visually inspect the battery pack for corrosion which indicates that venting has occurred. If corrosion is excessive, the battery pack may require replacement.

5.8 POWER SUPPLY VERIFICATION AND ADJUSTMENT

5.8.1 DC Output Voltage Checks

The following procedure should be followed for checking the power supply output voltage.

CAUTION

Be aware that a potential shock hazard exists on this board.

1) Remove all external power from the Analyzer and verify that the Function switch is in the OFF position. Remove the six screws that secure the power supply rear panel, four screws securing A1's power supply panel, and two screws securing A2 through rear panel. Refer to figure 7-1. Remove the eight screws that hold the top cover in place. Place a screwdriver behind the top right corner of the power supply back panel. Use the screwdriver to pry the power supply assembly loose from the Motherboard connector, then remove Power Supply Board A1.

2) Insert the Extender Card (P/N 110260) into the A1 slot. Note that the keying slots face the top.

3) Plug the power supply board into the extender card and support the outer edge of the board with a wood block or some other suitable insulated material. Connect the rear panel bracket to the metal frame of the 626G, using an alligator-to-alligator clip lead.

4) Reapply power and let the output voltage stabilize for at least 2 minutes.

5) Measure the power supply output voltages of Table 5-2 with DVM.

TABLE 5-2

Power Supply Output Voltages

Pin (Edge Connector)	Voltmeter Reading
22	+15V ± 0.5V
52	+15V ± 0.5V
1	+5V ± 0.1V
31	+5V ± 0.1V
4	+5V ± 0.1V
34	+5V ± 0.1V
2	+12V ± 0.6V
32	+12V ± 0.6V
29	-12V ± 0.6V
59	-12V ± 0.6V

Note: Connect the negative lead to case ground and the positive lead as indicated above.

6) The power supply provides a highly stable voltage source. If the readings on all pins are out of toleance, Power Supply Board A1 should be returned for factory service. Before doing so, check that the DC voltmeter accuracy is within tolerance and that the finger contacts of the circuit board are clean and properly mated. If a variation in readings is obtained, turn the power off and remove the power supply board. Clean the finger contacts with a clean pencil eraser, being careful not to use excessive pressure.

5.8.2 DC Output Voltage Adjustments (See fig. 7-7.)

The DC output voltages of the power supply can be adjusted as described below. If voltages cannot be adjusted as set forth in this procedure, return the power supply for factory service.

1) If adjustment is required, remove the power supply as outlined in paragraph 5.8.1.

CAUTION

Be aware that a potential shock hazard exists on this board.

2) Connect the voltmeter to the anode of CR9. The voltmeter should read +15.3V ±0.5V. If adjustment is required, adjust A1R18.

3) Connect the voltmeter to pin 1. The voltmeter should read +5V ±0.1V. Repeat for pins 31, 4, and 34. If adjustment is required, adjust A1R66, being very careful not to adjust the voltage above 5.5V DC. This will set off the overvoltage crowbar on the +5V output. If the overvoltage crowbar is triggered, A1R66 will no longer have effect since the +5V output will be shorted. In order to be able to readjust the output:

   a) the power supply must be turned off,

   b) A1R66 must be reset so that the crowbar circuit does not trigger, and

   c) power must be reapplied to the power supply.

NOTE *Steps a, b and c may have to be repeated.*

   d) A1R66 must be readjusted to +5V ±0.1V DC.

4) Connect voltmeter to pin 22. The voltmeter should read +15V ±0.5V. If adjustment is required, adjust A1R58. Repeat for pin 52.

5) Connect the voltmeter to pin 27. The voltage should read -14.5 ±0.1V. If adjustment is necessary, readjust A1R52, then connect the voltmeter to measure the following points:

Pins 2 and 32 should read +12V ±0.6V. Pins 29 and 59 should read -12V ±0.6V.

5.9 CALIBRATION OF REAL TIME OSCILLATOR FREQUENCY

To calibrate the real time oscillator frequency, proceed as follows:

1) Turn the Function switch to the OFF position and remove all external power.

2) Remove the top plastic cover from the 626G.

3) Disconnect the 626G battery pack.

4) Remove the six screws that secure the power supply rear panel, 4 screws securing A1's power supply panel, and two screws securing A2 through the rear panel. Insert a screwdriver blade behind the top right corner of the power supply back panel. Use the screwdriver to pry the power supply assembly loose from the motherboard connector. Remove power supply board A1, then remove control board A2. Refer to figure 7-1.

5) Insert the Extender Card (P/N 112152) into the A2 slot. Insert Extender Card (P/N 110260) into the A1 slot. Note that the keying slots face the top.

6) Plug the Control Board and Power Supply Board into the extender cards and support the outer edges of the Boards with a wooden block or other suitable insulated material. Connect the rear panel bracket to the metal frame of the 626G, using an alligator-to-alligator lead.

7) Connect a high accuracy frequency counter to pin 21 of U45. Refer to figure 7-9. Turn the Analyzer on.

8) Adjust C6, using a non-metallic adjustment tool, for a reading of 32,768.00 Hz ±0.537 Hz or 30.517578 uSec ±0.0005 uSec.

9) After adjustment, remove all power, disconnect the 626G battery pack, and reinsert the Control Board and Power Supply Board, ensuring that the boards are firmly seated in their connectors on the Motherboard. Then, reconnect the 626G battery pack and reassemble the unit.

5.10 BAUD RATE ADJUSTMENT

The baud rate for communications port J2 on the Control Board can be adjusted by means of 4 position DIP switch S1. Refer to figure 7-9 for the location of the switch at top-center.

Table 5-3 defines the baud rate settings of switch S1.

TABLE 5-3

Baud Rate Settings for Control Board Switch S1

S1 Setting	Baud Rate
0	50
1	75
2	110
3	134.5
4	150
5	300
6	600
7	1200
8	1800
9	2000
A	2400
B	3600
C	4800
D	7200
E	9600
F	19200 (not recommended)

5.11 RESTORING AN ANALYZER TO OPERATION

Observe the following precautions after an Analyzer has been serviced:

1) Be sure the screws which secure the Power Supply Assembly to the frame are replaced, otherwise mechanical and electrical damage will result.

2) Be sure that the screws securing Control Board A2 are replaced.

3) Verify that the original PROMs on Control Board A2 are properly inserted in their respective sockets.

4) Verify that the correct baud rate has been selected.

5) Verify that the 626G battery pack is reconnected.

6) Be sure that the 115V/230V selector switch is set for the intended power source.

SECTION VI

REPLACEABLE PARTS LIST

6.1 INTRODUCTION

This replaceable Parts List identifies all maintenance parts in the Series 626G mainframe. For each part, the reference designation (if applicable) is shown, along with the part number, manufacturer's code number and description. All maintenance parts are shown on assembly drawings located in Section VII.

6.2 MANUFACTURER'S CODES

The manufacturers codes in this parts list are identified below:

MAN. CODE	MANUFACTURER
00779	AMP, Inc., Harrisburg, PA 1710
23207	Dranetz Technologies, Inc. 1000 New Durham Road, P.O. Box 4019 Edison, N.J. 08818-4019
81349	On MIL SPEC List. Manufactured to meet Military Specifications, MS81349. Available from a variety of manufacturers.

6.3 ORDERING PARTS

Parts may be ordered from your authorized Dranetz representative or directly from Dranetz by calling or writing:

Dranetz Technologies, Inc.
1000 New Durham Rd.
Edison, NJ 08818-4019

Attention: Order Entry

Tel: (908) 287-3680
FAX: (908) 287-8627
TWX: (710) 997-9553
Telex: 499-7808
Cable: DRANETZ

TABLE 6-1

Mainframe Assembly 112100-G4, Parts List

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
A1	112175-G2	23207	Power Supply
A2	114300-G[]	23207	Control Board
A3-A7	*	23207	626-PA-( )*
A8	114356-G1	23207	Keyboard Logic
A9	114362-G2	23207	Motherboard
A10	110345-G5	23207	Thermal Printer
A11	114350-G1	23207	Printer Control
	110292	23207	Accessory Connector
	114380-G1	23207	Membrane Keyboard, Top
	112107	23207	Membrane Keyboard Bottom
	113345-G1	23207	Battery Pack
(4 supplied)	102714-G2	23207	Paper Roll
	103418	23207	Printhead Cleaning Paper
	107517-G1	23207	Keylock
	110260	23207	Extender Board, Dual 30 Pin
	112152	23207	Extender Board, Dual 40 Pin
	112128-G3	23207	Case and Cover Kit

*Module slots for plug-ins are ordered by the user. Refer to associated plug-in manuals. Refer to Table 4-6 for list of plug-ins.

TABLE 6-2

Power Supply Assembly A1, 112175-G2, Parts List

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
B1	113344-G1	23207	Fan
C1,	103209-G3	23207	Cap Cer, 0.47uF±0%, 50V
C3, C27	104078-G1	23207	Cap Cer, 330pF±10%, 1KV
C4, C19, C24, C32	104070-G1	23207	Cap Elec, 2200uF, +30% -10%, 25V
C5, C38	103209-G2	23207	Cap Cer, 0.22uF±20%, 50V
C6	104038-G1	23207	Cap Cer, .001uF±10% 200V
C7, C34	104038-G2	23207	Cap Cer, .01uF±10% 100V
C9	104079-G1	23207	Cap Elec, 10uF +50%-10%, 35V
C10, C13, C16 C17, C36	104080-G1	23207	Cap Elec, 47uF±20%, 50V
C18, C35	103209-G1	23207	Cap Cer, 0.1uF±20% 50V
C20	104038-G9	23207	Cap Cer, .0033uF±10%, 100V
C23	104100-G1	23207	Cap Elec, 100uF, +30% -10%, 50V
C25	104015-G2	23207	Cap Mica, 220pF±5%, 100V
C26	104100-G3	23207	Cap Elec, 470uF, -10% +30%, 35/50V
C28	104081-G1	23207	Cap Flm, 0.47uF±10%, 250V
C29, C30	104082-G1	23207	Cap Elec, 100uF, +50% -10%, 250V
C33	104132-G1	23207	Cap Elec, 470uF±20%, 25V
C39	104084-G1	23207	Cap Metal Paper,0.1uF±20%, 250V
CR3, CR11-CR15, CR34, CR35	104414-G2	23207	Diode, Fast Recovery
CR5	104412-G2	23207	Diode, General Purpose

TABLE 6-2

Power Supply Assembly A1, 112175-G2, Parts List (Continued)

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
CR6	104405-G1	23207	Diode, General Purpose
CR7, CR8, CR10	104409-G1	23207	Diode, Fast Recovery
CR9	104431-G1	23207	Diode, Schottky
CR16, CR19	104439-G1	23207	Rectifier Fast Recov 200v 16A, Dual Center-Tapped (Positive)
CR23	104440-G1	23207	Rectifier Fast Recov 200v 16A Dual Center Tapped (Negative)
CR25-CR30	104405-G2	23207	Diode, General Purpose
CR31	104403-G4	23207	Diode, General Purpose
CR32	104423-G2	23207	Rectifier, Schottky, 45V, 10A
CR33	104404-G6	23207	Diode, Zener
CR36	104430-G1	23207	Diode, Schottky, 1A
F1	110875-G1	23207	Fuse 2A, 250V Fast blow
	110839-G1	23207	Fuseholder, Body PC MT
	107523-G1	23207	Fuse Carrier
F2	113338-G1	23207	Fuse 1/2A 250V, Slow Blow, Pigtail
J1	107507	23207	Connector
J2	110704-G2	23207	Power Connector with Line Filter
J3	640454-2	00779	Post Header 0.100 Centers
K1	107509-G1	23207	Relay, 12V
L1, L9	104650-G2	23207	Inductor, 100 uH
L2, L5, L8	104643	23207	Inductor, 116 uH Nom.
L3	104616	23207	Inductor, 500 uH, 2A
L4	104642	23207	

TABLE 6-2

Power Supply Assembly A1, 112175-G2, Parts List (Continued)

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
L14, L15, L19, L20	104635-G1	23207	Ferrite Bead
P1	107506	23207	Connector
P2	640440-2	00779	Housing, 0.100 Centers
Q2, Q7	104530-G2	23207	Transistor, NPN, Power, 400V, 4A
Q3, Q4	104500-G3	23207	Transistor, Power
Q5	104505	23207	Transistor, NPN
Q6, Q9	104547-G2	23207	Transistor, MOSFET N-Chan, 100V, 0.18Ω
Q8	104545-G1	23207	Transistor, NPN
Q10, Q13	104506	23207	Transistor
Q11	104557-G1	23207	Thyristor, Std. Triode
Q12	104541	23207	Transistor
R3	104777-G7	23207	Res WW, 10Ω±5%, 3-1/4W
R4	RN55C4642F	81349	Res Flm, 46.4K±1% 1/10W
R5	RN55C4992F	81349	Res Flm, 49.9K±1% 1/10W
R6, R7	RCR07G511J	81349	Res Comp, 510Ω±5%, 1/4W
R8, R9	RN55C3011F	81349	Res Flm, 3.01K±1% 1/10W
R10	RN55C1243F	81349	Res Flm, 124K±1% 1/10W
R11	RCR07G114J	81349	Res Comp, 110K±5%, 1/4W
R12	RN55C3482F	81349	Res Flm, 34.8K±1% 1/10W
R13, R14	RN55C1212F	81349	Res Flm, 12.1K±1% 1/10W
R15, R40	RCR07G510J	81349	Res Comp, 51Ω±5%, 1/4W
R16, R41	RCR07G270J	81349	Res Comp, 27Ω±5%, 1/4W
R17, R39	RCR32G751J	81349	Res Comp, 750Ω±5% 1W
R18,	104703-G5	23207	Res Var 2K±10% 1/2W

TABLE 6-2

Power Supply Assembly A1, 112175-G2, Parts List (Continued)

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
R19	RCR07G155J	81349	Res Comp, 1.5M±5%, 1/4W
R20	RCR07G272J	81349	Res Comp, 2.7K±5% 1/4W
R21, R44, R77	RCR07G242J	81439	Res Comp, 2.4K±5%, 1/4W
R22, R32, R34, R45	RCR07G472J	81439	Res Comp, 4.7K±5%, 1/4W
R23	104790-G2	23207	Res WW 0.1Ω±1%, 3W
R24,	RCR07G821J	81349	Res Comp, 820Ω±5% 1/4W
R25, R62, R64	RCR07G131J	81439	Res Comp, 130Ω±5% 1/4W
R26	RN60C2491F	81349	Res Flm, 2.49K±1% 1/8W
R27	RCR07G153J	81439	Res Comp, 15K±5%, 1/4W
R28, R29	RCR07G101J	81439	Res Comp, 100Ω±5%, 1/4W
R30, R31	RCR07G471J	81439	Res Comp, 470Ω±5%, 1/4W
R33	RCR07G104J	81439	Res Comp, 100K±5% 1/4W
R35, R48, R65 R75	RCR07G102J	81349	Res Comp, 1K±5%, 1/4W
R36, R37	104787-G1	23207	Res Comp, 0.1Ω±5%, 2W
R42	110712-G1	23207	Thermistor, 40Ω, Soft Start, Current Limit
R43	104788	23207	Transient Suppressor
R46	RCR07G392J	81349	Res Comp, 3.9K±5%, 1/4W
R47	RCR07G221J	81349	Res Comp, 220Ω±5%, 1/4W
R49, R59, R72, R73, R75	RCR07G103J	81349	Res Comp, 10K±5%, 1/4W
R50	RCR07G182J	81349	Res Comp, 1.8K±5%, 1/4W
R51, R71	RCR07G432J	81349	Res Comp, 4.3K±5%, 1/4W
R52	104700-G3	23207	Res Var, 1K±10%, 1/2W
R53-R55	104787-G2	23207	Res WW 1Ω±5%, 2W

TABLE 6-2

Power Supply Assembly A1, 112175-G2, Parts List (Continued)

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
R56	RCR07G122J	81349	Res Comp, 1.2K±5%, 1/4W
R57	RCR07G133J	81349	Res Comp, 13K±5%, 1/4W
R58	104701-G1	23207	Res Var, 2K±10%, 1/2W
R60, R61	RCR20G104J	81349	Res Comp, 100K±5%, 1/2W
R63	RCR07G241J	81349	Res Comp, 240Ω±5%, 1/4W
R66	104703-G10	23207	Res Var, 5K±10%, 1/2W
R67	RCR07G682J	81349	Res Comp, 6.8K±5%, 1/4W
R68	RCR07G332J	81349	Res Comp, 3.3K±5%, 1/4W
R69	RCR07G751J	81349	Res Comp, 750Ω±5%, 1/4W
R70	104790-G1	23207	Res WW, 0.2Ω±5%, 2W
R76	RCR07G301J	81349	Res Comp, 300Ω±5%, 1/4
R80	RCR07G105J	81349	Res Comp, 1M±5%, 1/4W
S1	104804	23207	Switch, Slide, 2PDT
T1, T2	104684-G1	23207	Transformer, Drive, Matched Pair
T3	104644	23207	Transformer, Output Converter
T4	110878-G1	23207	Transformer, Isolation
T5	104669	23207	Transformer, Power
U1	104260-G1	23207	IC, Quad Volt Comparator
U2, U5, U7	112011-G2	23207	IC, Reg Pulse Width Modulator
U3	104253	23207	Voltage Regulator, +12V, 1.5A
U4	104209	23207	Voltage Regulator, -12V, 1.5A
U6	104261-G1	23207	IC, Pwr Supply Inv

TABLE 6-3

Control Board Assembly A2, 114300-G3/-G4, Parts List

REF DESIG	PART NUMBER	MAN CODE	DESCRIPTION
BB1-BB3	106706	23207	Bus Bar
C1, C5	104027-G3	23207	Cap Mica, 15pF±5%, 100V
C3	104026-G5	23207	Cap Mica, 20pF±5%, 500V
C4, C10 C14-C17, C22, C30*, C75	104145-G3	23207	Cap Cer, 0.47uF±20%, 50V
C6	104107-G3	23207	Cap Var, 6.5-30pF, 100V
C7, C32, C34, C36	104067-G7	23207	Cap Tant, 33uF±20%, 16V
C8, C9, C11 C18-C21, C31 C33, C35, C37-C60, C72-C74 C81-C90	104145-G1	23207	Cap Cer, 0.1uF±20% 50V
C12, C13	104145-G5	23207	Cap Cer, 0.01uF±20%, 50V
C27*, C28*	104000-G4	23207	Cap Tant, 56uF±10%, 6V
C29*	103204-G3	23207	Cap Tant, 8.2uF±10%, 15V
C76, C77	104015-G2	23207	Cap Mica 220pF±5%
C78-C80	104038-G3	23207	Cap Cer, 2200pF±10%, 100V
CR1-CR4, CR6- CR11	104412-G2	23207	Diode
CR5	104403-G6	23207	Diode, Zener, 5.1V
DC1*	104248-G1	23207	DC-to-DC Converter, 5V
F1, F2	110842-G1	23207	Fuse, 1/16 A
J1	113262-G6	23207	Connector, 9 Pos, Female 'D'
J2	113262-G2	23207	Connector, 25 Pos, Female, 'D'
J3	110841-G1	23207	Stereo Jack

*Used on Option 102 only.

TABLE 6-3

Control Board Assembly A2, 114300-G3/-G4, Parts List (Continued)

REF DESIG	PART NUMBER	MAN CODE	DESCRIPTION
K1	104937	23207	Relay
L1	104623	23207	Inductor, 18 uH±5%, 300 mA
L2-L13	103580-G1	23207	Ferrite Bead
LS1	110823-G2	23207	Audio Transducer
Q1, Q2, Q4	104559-G1	23207	FET
Q3	104505	23207	Transistor, NPN
R1, R10, R13, R17-R19, R30 R31, R37	RCR07G105J	81349	Res Comp, 1M±5%, 1/4W
R2	RCR07G106J	81349	Res Comp, 10M±5%, 1/4W
R4-R9, R16, R20, R41, R42, R47, R51, R52, R54-R57	RCR07G103J	81349	Res Comp, 10K±5%, 1/4W
R11, R12, R34	RCR07G513J	81349	Res Comp, 51K±5%, 1/4W
R14	RCR07G226J	81349	Res Comp, 22M±5%, 1/4W
R15	RCR07G100J	81349	Res Comp, 10Ω±5%, 1/4W
R21	RCR07G203J	81349	Res Comp, 20K±5%, 1/4W
R22	RCR07G181J	81349	Res Comp, 180Ω±5% 1/4W
R23	RCR07G271J	81349	Res Comp, 270Ω±5%, 1/4W
R24*, R43	RCR07G512J	81349	Res Comp, 5.1K±5%, 1/4W
R32, R33, R39 R40, R44-R46, R48-R50	RCR07G102J	81349	Res Comp, 1K±5%, 1/4W
R38	RCR07G825J	81349	Res Comp, 8.2M±5%, 1/4W
R53, R58, R59	RCR07G472J	81349	Res Comp, 4.7K±5%, 1/4W
R60	RCR07G101J	81439	Res Comp, 100Ω±5%, 1/4W

*Used on Option 102 only.

TABLE 6-3

Control Board Assembly A2, 114300-G[], Parts List (Continued)

REF DESIG	PART NUMBER	MAN CODE	DESCRIPTION
RN1	104791	23207	Res Network, 10K, SIP, 9 Common
RN2, RN3, RN4	104748-G2	23207	Res Network, 22Ω, DIP, 8 Res
S1	104835	23207	Switch, 4-Bit Binary DIP
U1, U2, U24	104290-G6	23207	IC, Octal 3-State Buffer
U3	104268-G1	23207	IC, Microprocessor
U5	104235	23207	IC, RAM, 2K Byte
U10	104270-G1	23207	IC, RAM, 2K Byte
U11	105375 (Decal # 103457-G284)	23207	IC, EPROM, 8K Byte
U12	105376 (DECAL # 103457-G285)	23207	IC, EPROM, 8K Byte
U13, U33, U48	104392-G7	23207	IC, Octal 3-State Buffer
U15	104392-G3	23207	IC, Quad 2-Input OR Gate
U16, U36	104290-G3	23207	IC, Octal Transceiver
U17, U37	112008-G1	23207	IC, Hex Inverter
U18, U19, U47	104392-G2	23207	IC, Dual D Latch
U20, U46	104392-G1	23207	IC, Quad 2-Input NAND Gate
U21, U27, U38	104271-G3	23207	IC, 1 of 8 Decoder
U22, U23	104290-G2	23207	IC, 1 of 8 Decoder
U29	104271-G4	23207	IC, 1 0f 4 Decoder
U30, U34, U35	112007-G1	23207	IC, 13 Input NAND Gate
U32	104268-G3	23207	IC, Versatile Interface Adapater
U45	104273-G1	23207	IC, Time Clock
U49	104332	23207	IC, Opto-coupler

TABLE 6-3

Control Board Assembly A2, 114300-G[], Parts List (Continued)

REF DESIG	PART NUMBER	MAN CODE	DESCRIPTION
U50	104283-G1	23207	IC, Dual Timer
U51	112012-G1	23207	IC, Dual Baud Rate Gen
U52, U53	104269-G3	23207	IC, Serial Comm Interface
U55	104222-G1	23207	IC, RS 232 Line Driver
U56	104222-G2	23207	IC, RS 232 Line Receiver
U58, U59	104228	23207	IC, Dual Op Amp
U60-U62	104243-G3	23207	IC, Dual Opto-coupler
U63, U64	104271-G5	23207	IC, Quad 2 Input NOR Gate
U66	112043-G2	23207	IC, Watchdog Timer
VR1-VR3	110753	23207	Varistor
XJ6	110749-G3	23207	IC Socket, 16 Pin
XU3, XU32	110749-G9	23207	IC Socket, 40 Pin
XU5, XU10-XU12	110749-G8	23207	IC Socket, 28 Pin
XU45, XU52, XU53	110749-G7	23207	IC Socket, 24 Pin
Y1	113362-G1	23207	Crystal, 16 MHz
Y2	107546-G1	23207	Crystal, 32.768 KHz
Y3	107454	23207	Crystal, 5.0688 MHz

TABLE 6-4

Keyboard Logic Assembly A8, 114356-G1

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
C6-C14, C59	104145-G5	23207	Cap Cer, 0.01uF±20%, 50V
C57	104000-G4	23207	Cap Tant, 56uF±10%, 6V
CR1	104405-G1	23207	Diode
DS1, DS2, DS8, DS9	104976	23207	LED (Red)
DS3-DS6, DS10	104977	23207	LED (Yellow)
DS7	110710-G1	23207	LED (Green)
DS11	104982	23207	Dual LED (Red/Green)
J1, J2	1-640454-0	00779	10 Pin, Straight Post Header,
J3	1-640455-0	00779	10 Pin, Right Angle Post Header,
J4	1-87543-0	00779	10 Pin, Straight Post Header
J6	640454-6	00779	6 Pin, Straight Post Header
J7	640454-4	00779	4 Pin, Straight Post Header
P2, P3	113353-G1	23207	Connector, 10 Pos
Q9	104567-G1	23207	FET, P-channel
R1, R2	RCR07G221J	81439	Res Comp, 220Ω±5%, 1/4W
R9, R13	RCR07G103J	81349	Res Comp, 10K±5%, 1/4W
R12	112354-G3	23207	Res WW, 12Ω±5%, 5W
RN1	104748-G1	23207	Resistor Network, 220Ω±10%
RN2	104751	23207	Resistor Network, 68K±10%
S1	104844	23207	Rotary Switch, 1 sec, 5 Pos
S2	104854	23207	Rotary Switch, 2 sec, 5 pos

TABLE 6-4

Keyboard Logic Assembly A8, 114356-G1 (Continued)

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
U1, U2	112007-G4	23207	IC, HCMOS Encoder
U3	104392-G7	23207	IC, HCMOS Tristate Octal Buffer
U4, U5	112007-G3	23207	IC, HCMOS Open Collector Hex Inverter
U6, U7	112057-G2	23207	IC, HCMOS 3 to 8 Decoder
U8, U9	112057-G4	23207	IC, HCMOS 8 Bit Addressable Latch
U10	104392-G1	23207	IC, HCMOS Quad NAND Gate
U23	112029-G2	23207	IC, HCMOS Hex Inverter
U50	104290-G6	23207	IC, HCMOS Tristate Octal Buffer
VR2, VR3	110753-G1	23207	Varistor, 4VAC, 4 Joules
XU8	104935	23207	IC Socket, 40 Pin
Y1	102753	23207	Crystal, 5.185 MHz
	LM112114-G1	23207	Power Switch Cable Assy
	112125	23207	Rotary Switch Flex Cable

TABLE 6-5

Motherboard Assembly A9, 114362-G2

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
C1	103209-G1	23207	Cap Cer, 0.1uF±20%, 50V
CR1	104424-G2	23207	Diode, Zener
J1	350428-1	00779	Pin Header Assy, 2 Pin
J2	350430-1	00779	Pin Header Assy, 4 Pin
P2/P1	113305-G5	23207	Socket Strip, Dual Row, 15 Pin
Q1-Q3	104505	23207	Transistor, NPN
R1	RCR07G203J	81349	Res Comp, 20K±5%, 1/4W
R2	RCR07G331J	81349	Res Comp, 330Ω±5%, 1/4W
R3	RCR07G271J	81349	Res Comp, 270Ω±5%, 1/4W
R4	RCR07G471J	81349	Res Comp, 470Ω±5%, 1/4W
RN1	104735-G1	23207	Res Network, 470Ω/330Ω
XA1, XA3-XA7	110836-G1	23207	Connector and Keying Plug Set
XA2	110836-G2	23207	Connector and Keying Plug Set

TABLE 6-6

Printer Control Board Assembly A11, 114350-G1, Parts List

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
B1	103699	23207	Stepping Motor Assembly
B2	RS365-1885	MABUCHI	DC Motor
C1, C2	104016-G4	23207	Cap Mica, 20pF±5%, 500V
C3, C4, C58	104067-G5	23207	Cap Tant, 10uF±5%, 6V
C5	104075-G4	23207	Cap Elec, 1000uF±20%, 5V
C18-C56	104145-G5	23207	Cap Cer, 0.01uF±20%, 50V
J5	11351-G1	23207	Post Header, Rt Angle, 28 Pos
J8/J9	110855-G6	23207	Terminal Strip, Dual 15 Pin
J10, J15, J16	640255-2	00779	Post Header, Rt Angle, 2 Pin
J11/J12	113354-G1	23207	Post Header, Rt Angle, dual 15 Pin
P2	640442-4	00779	Connector
Q1-Q8	104567-G1	23207	FET, P-channel
R3	RN55C1912F	81349	Res Flm, 19.1K±1%, 1/10W
R4, R7	RN55C3922F	81349	Res Flm, 39.2K±1%, 1/10W
R5	RN55C1272F	81349	Res Flm, 12.7K±1%, 1/10W
R6	RN55C1692F	81349	Res Flm, 16.9K±1%, 1/10W
R8	RN55C1182F	81349	Res Flm, 11.8K±1%, 1/10W
R11, R12	RCR07G103J	81349	Res Comp, 10K±5%, 1/4W
RN3, RN4	104756	23207	Res Network, DIP, 10K±10%, 16 Pin
S1	104845	23207	Low Torque Switch
U11, U12, U42	104392-G1	23207	IC, HCMOS, Quad 2 Input NAND Gate

TABLE 6-6

Printer Control Board Assembly A11, 114350-G1, Parts List (Continued)

REFERENCE DESIGNATION	PART NUMBER	MAN CODE	DESCRIPTION
R10	RCR07G106J	81349	Res Comp, 10M±5%, 1/4W
U13	104271-G1	23207	IC, HCMOS, Triple OR Gate
U14	112007-G1	23207	IC, HCMOS, 13 Input NAND Gate
U15, U16	104271-G3	23207	IC, HCMOS, 3 to 8 Decoder
U17, U20	104392-G7	23207	IC, HCMOS, Tristate Octal Buffer
U18	104290-G3	23207	IC, HCMOS, Tristate Octal Tansceiver
U19	104271-G2	23207	IC, HCMOS, Tristate Octal Latch
U21, U22	104271-G9	23207	IC, HCMOS, Hex Inverter
U26	104290-G6	23207	IC, HCMOS, Tristate Octal Buffer
U28, U31 U36-U38	112040-G2	23207	IC, HCMOS, Darlington Transistor Array
U29, U32-U34	104392-G4	23207	IC, HCMOS, D-Type Octal Flip-Flop
U30	112057-G2	23207	IC, HCMOS, 3 to 8 Decoder
U44	104295-G2	23207	IC, CMOS RAM, 8k x 8 Bit, 100 nSec
U49	104236-G2	23207	IC, JFET Dual Op-Amp
VR1	110753-G1	23207	Varistor, 4VAC, 4 Joules
XR1	112019-G1	23207	IC, Temp Transducer, TO-92
XU39	113352-G1	23207	Chip Carrier Socket, 52 Pin
XU43	ICO-628-NGT	SAMTEC	IC Socket, 28 Pin, Low Profile

SECTION VII

SCHEMATIC DIAGRAMS AND ASSEMBLY DRAWINGS

7.1 GENERAL

The diagrams in this section contain the schematic and wiring diagrams as well as the assembly drawings of the equipment comprising the Model 626G Universal Disturbance Analyzer. The schematic and wiring diagrams supplement the Theory of Operation and Maintenance sections (IV and V, respectively) of this manual. The assembly drawings illustrate and locate the parts referenced in the Replaceable Parts List (Section VI).

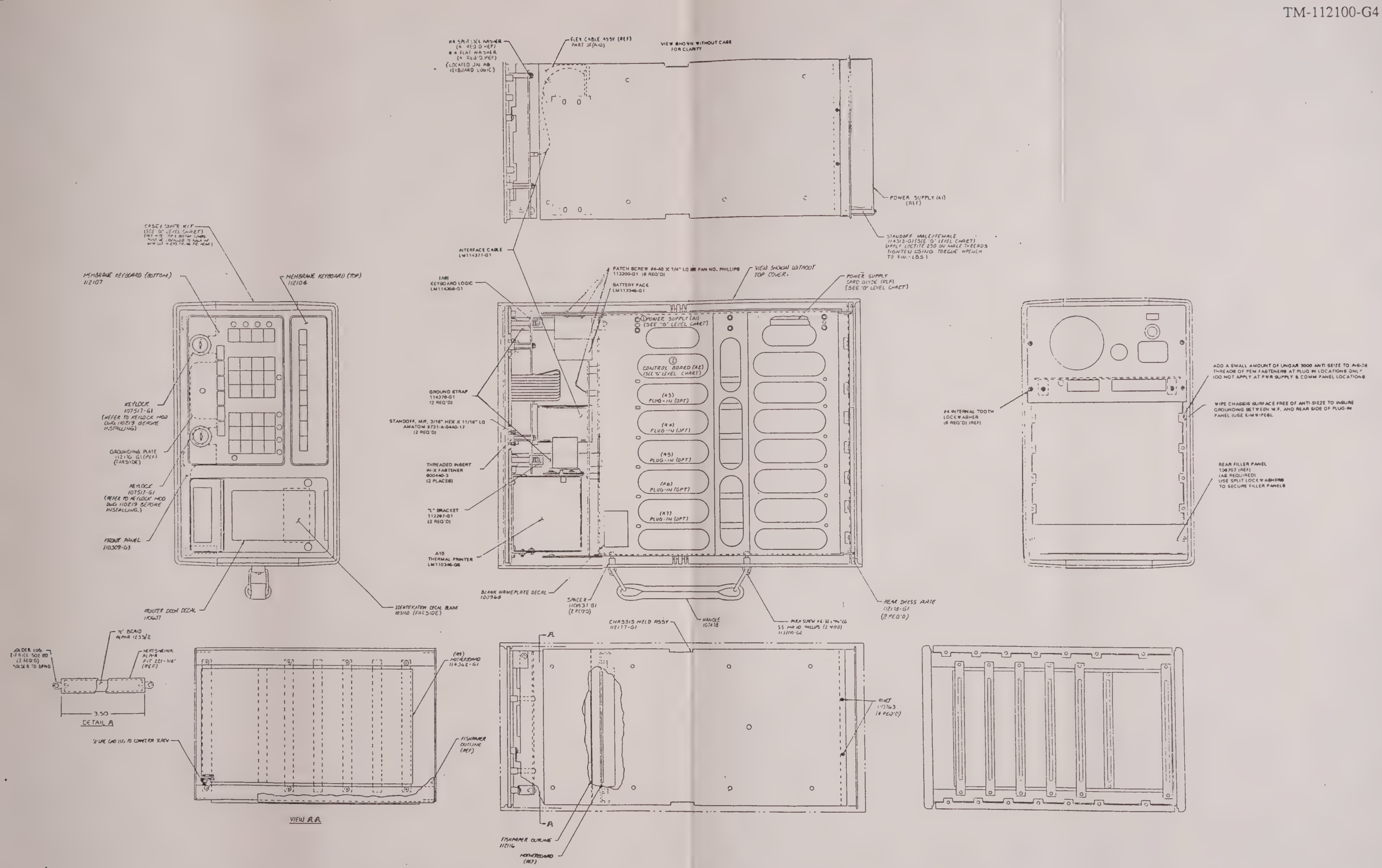
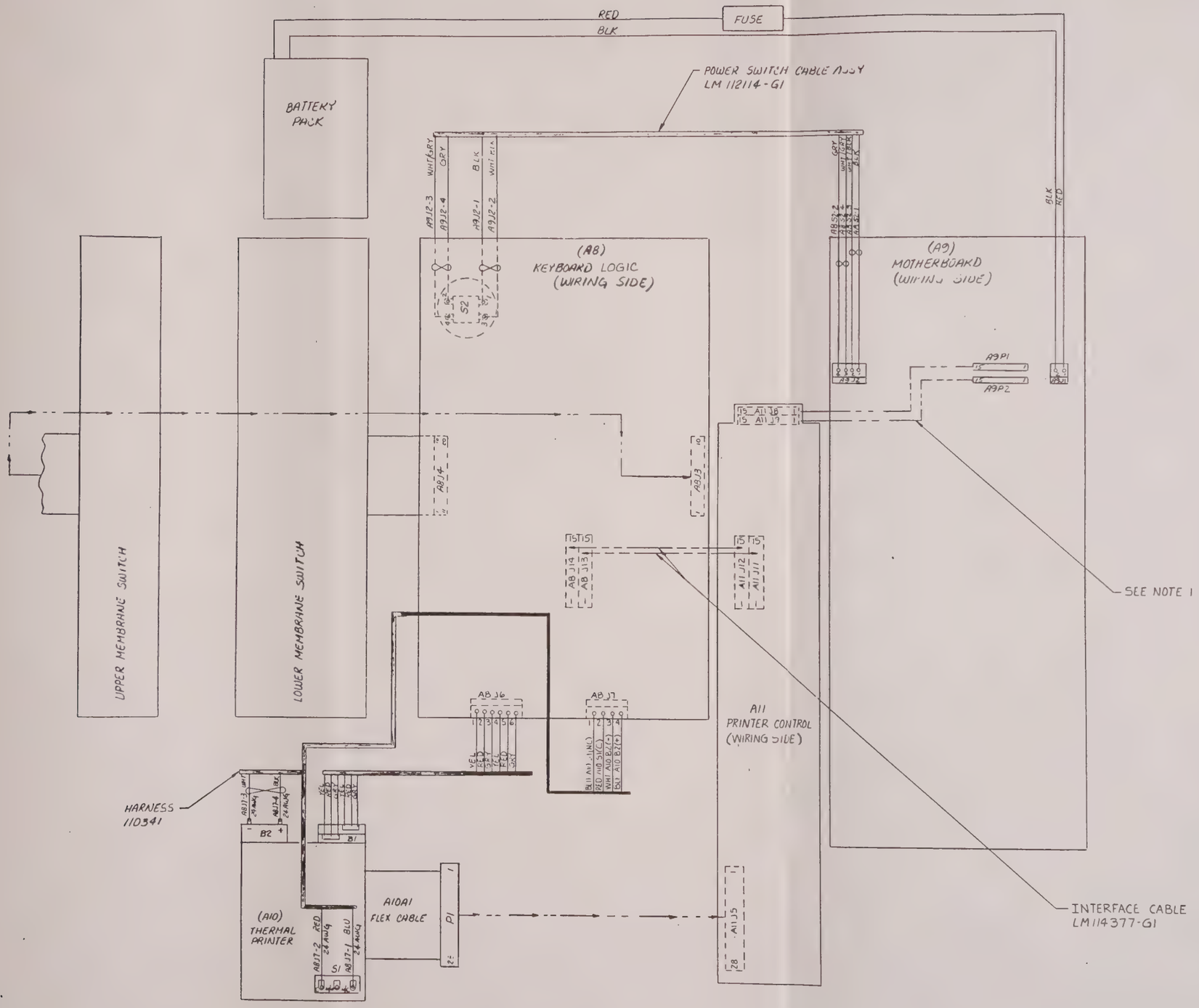
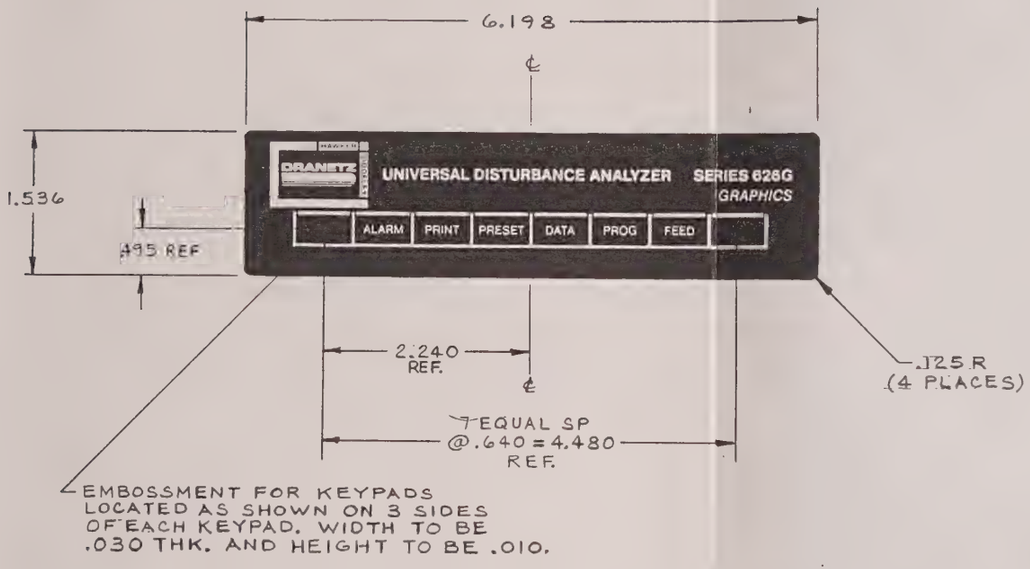

#4 SPLIT LOCKWASHER (6 REQ'D REF)
#4 FLAT WASHER (6 REQ'D REF)
(LOCATED ON A8 KEYBOARD LOGIC)
FLEX CABLE ASSY (REF) PART OF (A10)
VIEW SHOWN WITHOUT CASE FOR CLARITY
POWER SUPPLY (A1) (REF)
STANDOFF MALE/FEMALE 114313-G1(SEE 'G' LEVEL CHART) APPLY LOCTITE 290 ON MALE THREADS TIGHTEN USING TORQUE WRENCH TO 9 IN.-LBS.)
INTERFACE CABLE LW114377-G1
CASE COVER KIT (SEE 'G' LEVEL CHART) (NOT TO BE FOR BOTTOM CARD WITH LOT # 0219 OR HIGHER)
MEMBRANE KEYBOARD (BOTTOM) 112107
MEMBRANE KEYBOARD (TOP) 112104
KEYLOCK 107517-G1 (REFER TO KEYLOCK MOD DWG 110219 BEFORE INSTALLING)
GROUNDING PLATE 112136-G1 (REF) (FARSIDE)
FRONT PANEL 110309-G3
PRINTER DOOR DECAL 100437
IDENTIFICATION DECAL BLANK 103140 (FARSIDE)
(A8) KEYBOARD LOGIC LW114368-G1
PATCH SCREW #4-40 X 1/4" LG PAN NO. PHILLIPS 112200-G1 (8 REQ'D)
BATTERY PACK LW113346-G1
VIEW SHOWN WITHOUT TOP COVER.
POWER SUPPLY CARD GUIDE (REF) (SEE 'G' LEVEL CHART)
① POWER SUPPLY (A1) (SEE "G" LEVEL CHART)
② CONTROL BOARD (A2) (SEE 'G' LEVEL CHART)
(A3) PLUG-IN (OPT)
(A4) PLUG-IN (OPT)
(A5) PLUG-IN (OPT)
(A6) PLUG-IN (OPT)
(A7) PLUG-IN (OPT)
GROUND STRAP 114378-G1 (2 REQ'D)
STANDOFF, M/F, 3/16" HEX X 11/16" LG AMATOM 8731-A-0440-17 (2 REQ'D)
THREADED INSERT IN-X FASTENER 800440-3 (2 PLACES)
"L" BRACKET 112287-G1 (2 REQ'D)
A10 THERMAL PRINTER LW110346-G6
BLANK NAMEPLATE DECAL 100968
SPACER 110931-G1 (2 REQ'D)
HANDLE 107418
REAR SCREW #6-32 X 7/16" LG SS PAN HD PHILLIPS (2 REQ'D) 113200-G2
REAR DRESS PLATE 112118-G1 (2 REQ'D)
#4 INTERNAL TOOTH LOCKWASHER (8 REQ'D) (REF)
ADD A SMALL AMOUNT OF UNIGAR 3000 ANTI SEIZE TO A6-36 THREADS OF PEM FASTENERS AT PLUG IN LOCATIONS ONLY (DO NOT APPLY AT PWR SUPPLY & COMM PANEL LOCATIONS
WIPE CHASSIS SURFACE FREE OF ANTI-SEIZE TO INSURE GROUNDING BETWEEN W.S. AND REAR SIDE OF PLUG-IN PANEL (USE RUM WIPES).
REAR FILLER PANEL 106707 (REF) (AS REQUIRED) USE SPLIT LOCKWASHERS TO SECURE FILLER PANELS
CHASSIS WELD ASSY 112177-G1
RIVET 110763 (4 REQ'D)
FISHPAPER OUTLINE 112116
MOTHERBOARD (REF)
SOLDER LUG (PRICE SOLD AS (2 REQ'D) SOLDER TO BAND)
½" BRAID ALPHA 1233/2
HEATSHRINK ALPHA FIT 221-3/8" (REF)
3.50
DETAIL A
½" LUG (A6) TO CHASSIS SCREW
(19) MOTHERBOARD 114362-G1
FISHPAPER OUTLINE (REF)
VIEW A-A

Figure 7-1. Disturbance Analyzer, Series 626G, Mainframe Assembly, 112100-G4, Rev P



NOTES:
1. INDICATES MATING CONNECTORS. CONNECTION FROM A11J8/A11J9 (DOUBLE ROW PIN HEADER) MATED WITH A9P1/A9P2 (DOUBLE ROW "THROUGH-THE-BOARD" CONNECTOR.)

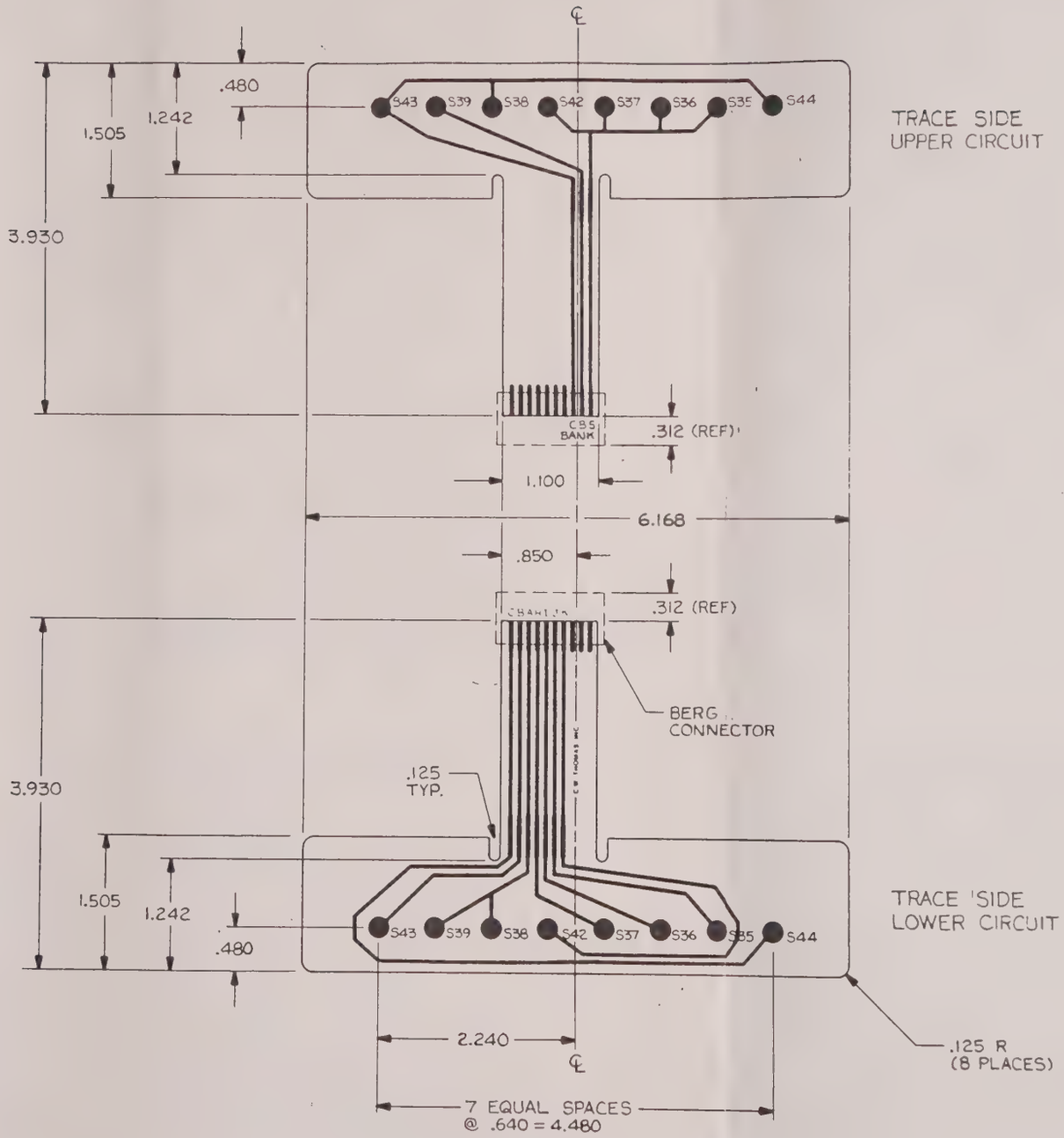
Figure 7-2. Mainframe Assembly, Interconnecting Wiring Diagram, 112102-G2, Rev B



NOTES:

1. MATERIAL = .010 POLYCARBONATE WITH A HARD COAT AND VELVET TEXTURE FINISH.
2. BACKGROUND TO BE APPLIED PER SILKSCREEN METHOD USING C.W. THOMAS TM-301 BLACK INK.
3. MARKING TO BE WHITE TO MATCH BORG WARNER 2500 (FOG).
4. DRANETZ TO SUPPLY ARTWORK.

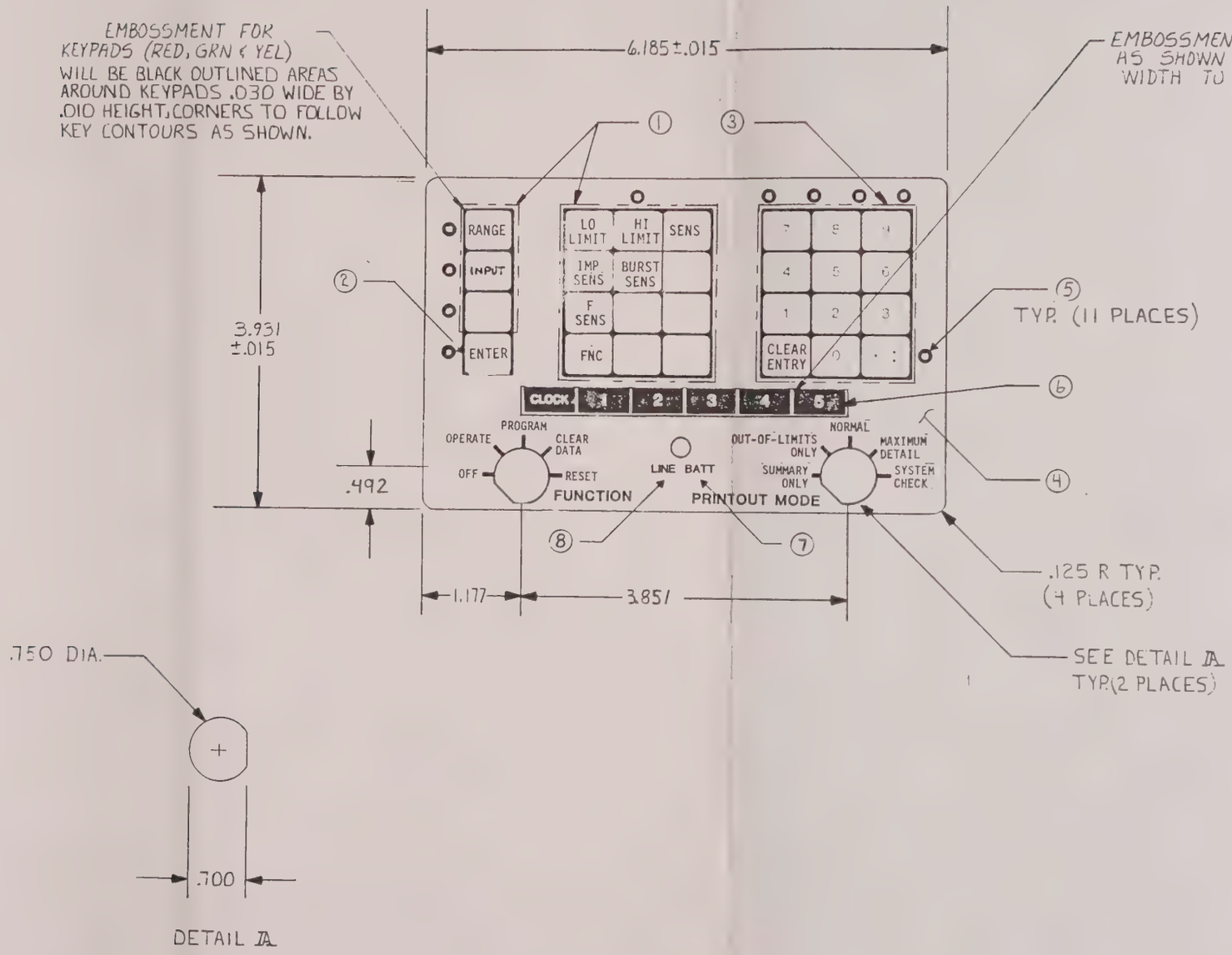
Figure 7-3. Keyboard, Top Membrane, 114380-G1, Rev A (Sheet 1)



NOTES:

1. MATERIAL:-.005 HEAT STABILIZED POLYESTER C.W. THOMAS #505
2. SILVER INK: C.W. THOMAS #8204
3. UPPER AND LOWER TAIL INSULATION:.001 POLYESTER
4. TERMINATION: UPPER & LOWER CIRCUIT TAILS TERMINATE INTO ONE BERG CLINCHER #65801-010.
5. MAXIMUM RESISTANCE 100 OHMS.
6. PAD ACTIVATION #4 OZ.
7. CIRCUIT PATTERN TO BE PER ARTWORK DWG No. 112106.

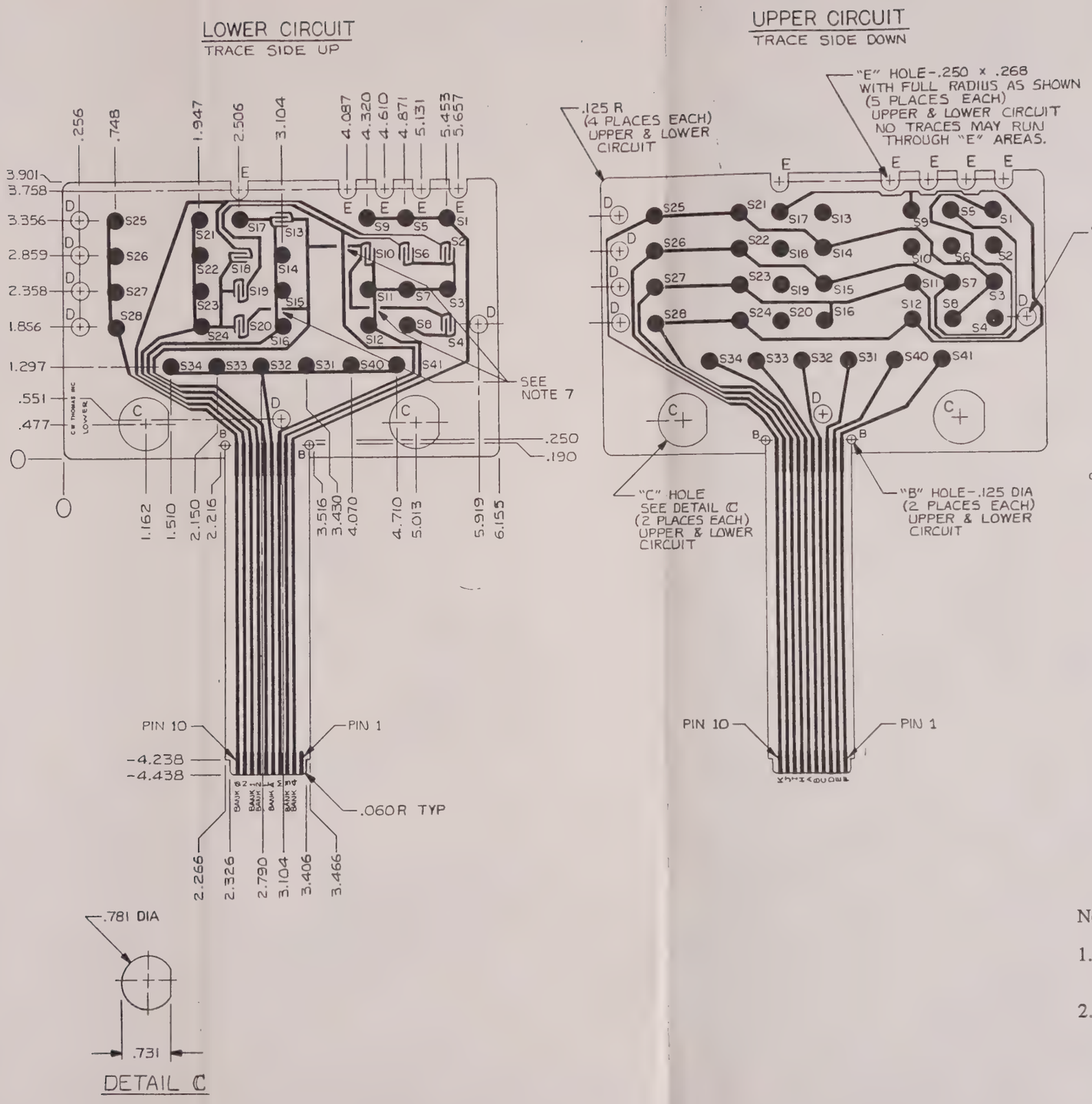
Figure 7-3. Keyboard, Top Membrane, 114380-G1, Rev A (Sheet 2)



NOTES:

1. MATERIAL: .010 POLYCARBONATE WITH A HARDCOAT & VELVET TEXTURE FINISH.
2. MARKING SHALL BE APPLIED TO TOP SURFACE USING INK WITH COLORS TO BE AS FOLLOWS:
   RED- C.W. THOMAS RED CWT-361
   YELLOW- C.W. THOMAS YELLOW CWT-358
   GREEN- C.W. THOMAS GREEN CWT-311
   WHITE- TO MATCH BORG WARNER 2500 (FOG) PER CWT 359
   BLACK- C.W. THOMAS BLACK TM-301
3. COLOR ARRANGEMENT TO BE AS FOLLOWS:
   ① RED BACKGROUND WITH WHITE LETTERING
   ② GREEN " " WHITE "
   ③ YELLOW " " BLACK "
   ④ WHITE " " BLACK "
   ⑤ CLEAR BACKGROUND
   ⑥ BLACK BACKGROUND WITH WHITE LETTERING
   ⑦ RED LETTERING
   ⑧ GREEN LETTERING
4. DRANETZ TO SUPPLY ARTWORK

Figure 7-4. Keyboard, Bottom Membrane, 112107, Rev D (Sheet 1)



Lower Keyboard Switch/Pin Identifier

Color	Function	Switch No.	Bank (Pin #)	Line (Pin #)
Y	0	8	4 (2)	K (10U)
Y	1	11	3 (3)	I (8U)
Y	2	7	3 (3)	J (9U)
Y	3	3	3 (3)	K (10U)
Y	4	10	3 (3)	L (6L)
Y	5	6	3 (3)	M (4L)
Y	6	2	3 (3)	N (9L)
Y	7	9	4 (2)	H (7U)
Y	8	5	4 (2)	I (8U)
Y	9	1	4 (2)	J (9U)
Y	.	4	4 (2)	L (6L)
Y	CLEAR ENTRY	12	3 (3)	H (7U)
R	blank	14	2 (7)	K (10U)
R	blank	15	2 (7)	J (9U)
R	blank	16	2 (7)	I (8U)
R	blank	19	1 (8)	M (4L)
R	blank	20	1 (8)	L (6L)
R	blank	27	0 (10)	I (8U)
R	BURST SENS	18	1 (8)	N (9L)
R	F SENS	23	1 (8)	I (8U)
R	FNC	24	1 (8)	H (7U)
R	HI LIMIT	17	2 (7)	H (7U)
R	IMP SENS	22	1 (8)	J (9U)
R	INPUT	26	0 (10)	J (9U)
R	LO LIMIT	21	1 (8)	K (10U)
R	RANGE	25	0 (10)	K (10U)
R	SENS	13	2 (7)	L (6L)
G	ENTER	28	0 (10)	H (7U)
B	CLOCK	34	A (5)	A (6U)
B	1	33	A (5)	B (5U)
B	2	32	A (5)	C (4U)
B	3	31	A (5)	D (3U)
B	4	40	A (5)	E (2U)
B	5	41	A (5)	F (1U)

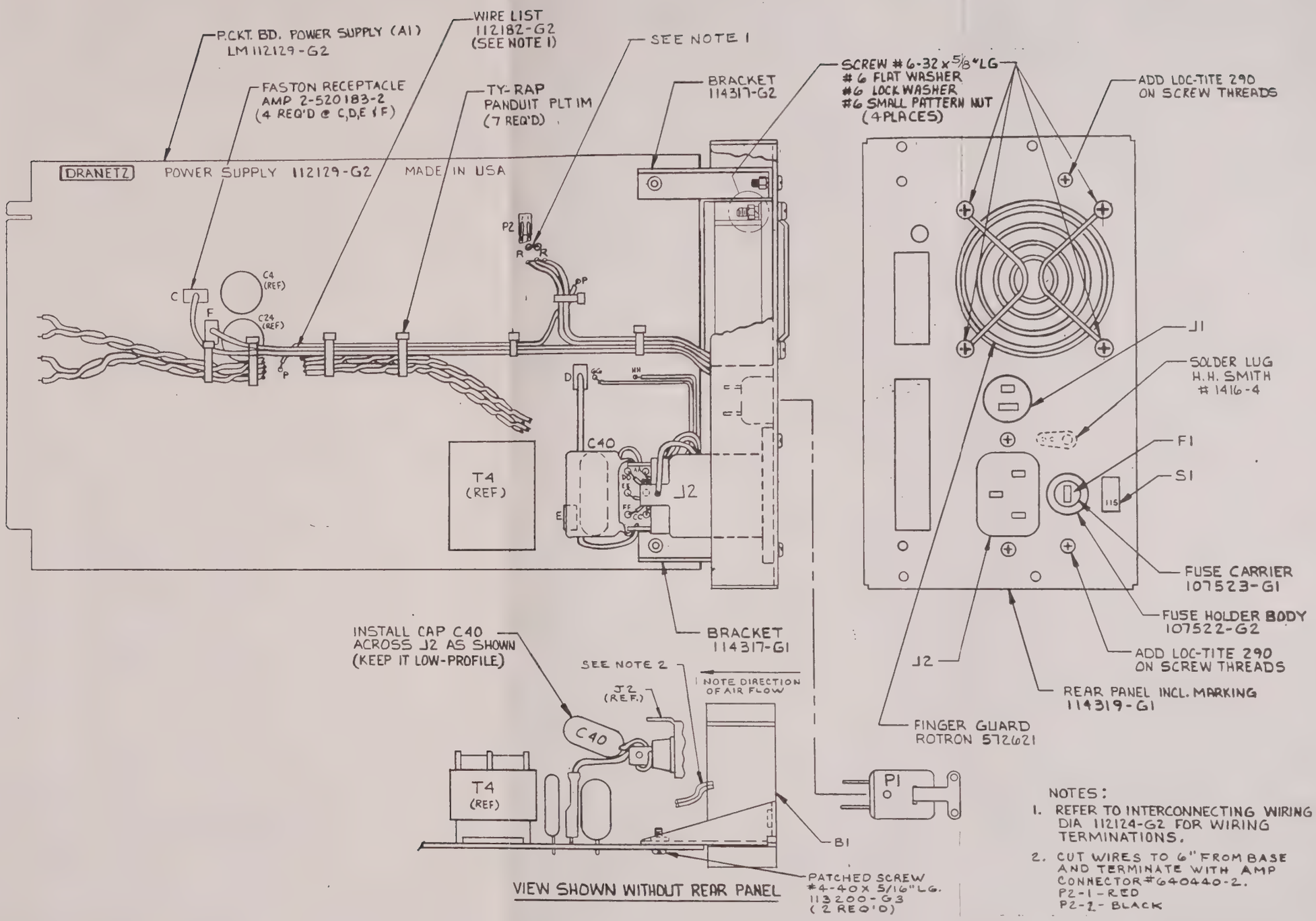
KEY: Y = Yellow
R = Red
G = Green
B = Black

U = Upper Circuit
L = Lower Circuit
All bank pin numbers are on the lower circuit

Notes:

1. Pressing switch (S#) will provide continuity at Bank(Pin #) and Line (Pin #) of connector.
2. The maximum resistance of each switch is 100 ohms.

Figure 7-4. Keyboard, Bottom Membrane, 112107, Rev D (Sheet 2)



NOTES:

1. REFER TO INTERCONNECTING WIRING DIA 112124-G2 FOR WIRING TERMINATIONS.
2. CUT WIRES TO 6" FROM BASE AND TERMINATE WITH AMP CONNECTOR #640440-2.
   P2-1 - RED
   P2-2 - BLACK

Figure 7-5. Mainframe-Power Supply Assembly, 112175-G2, Rev D

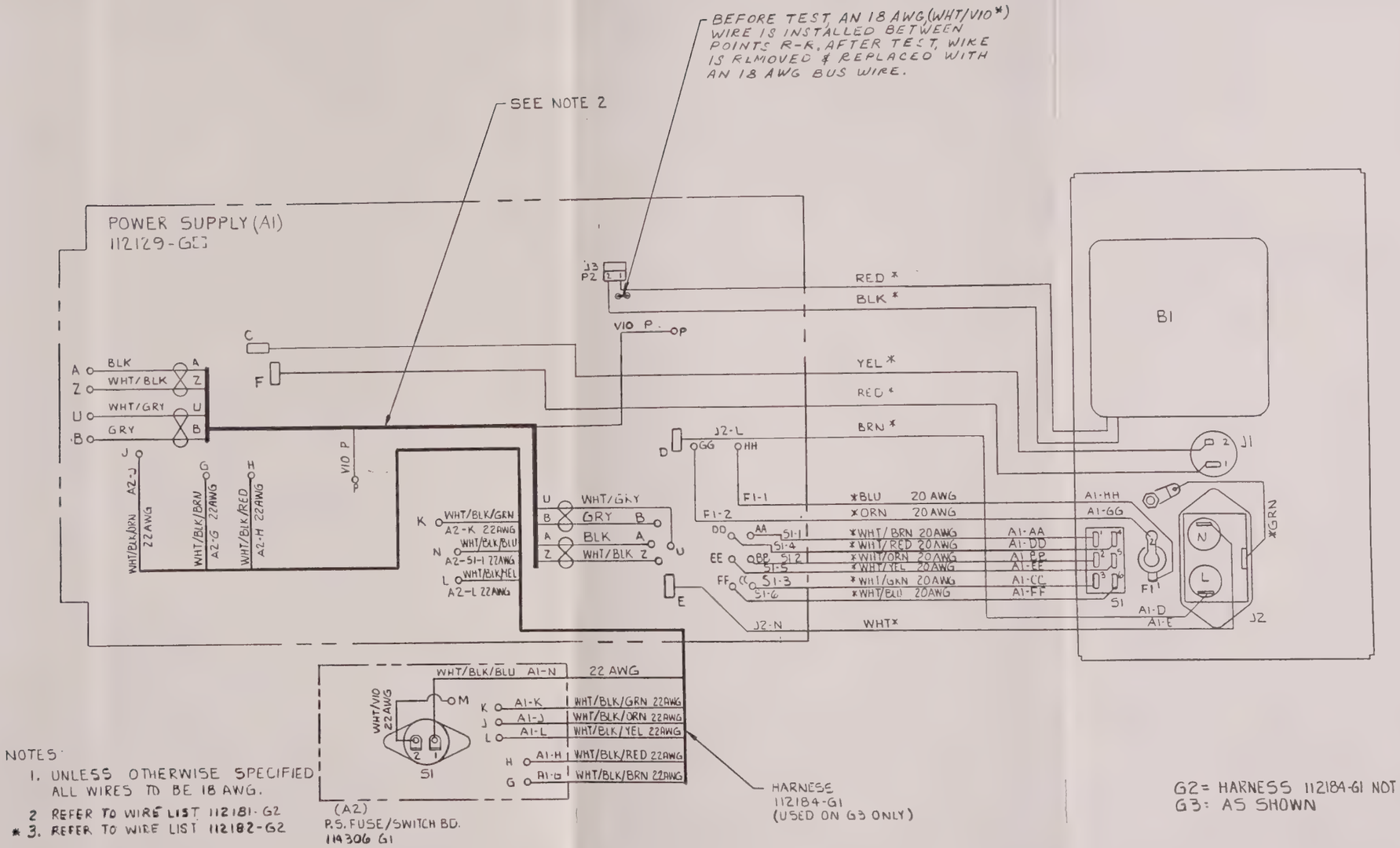
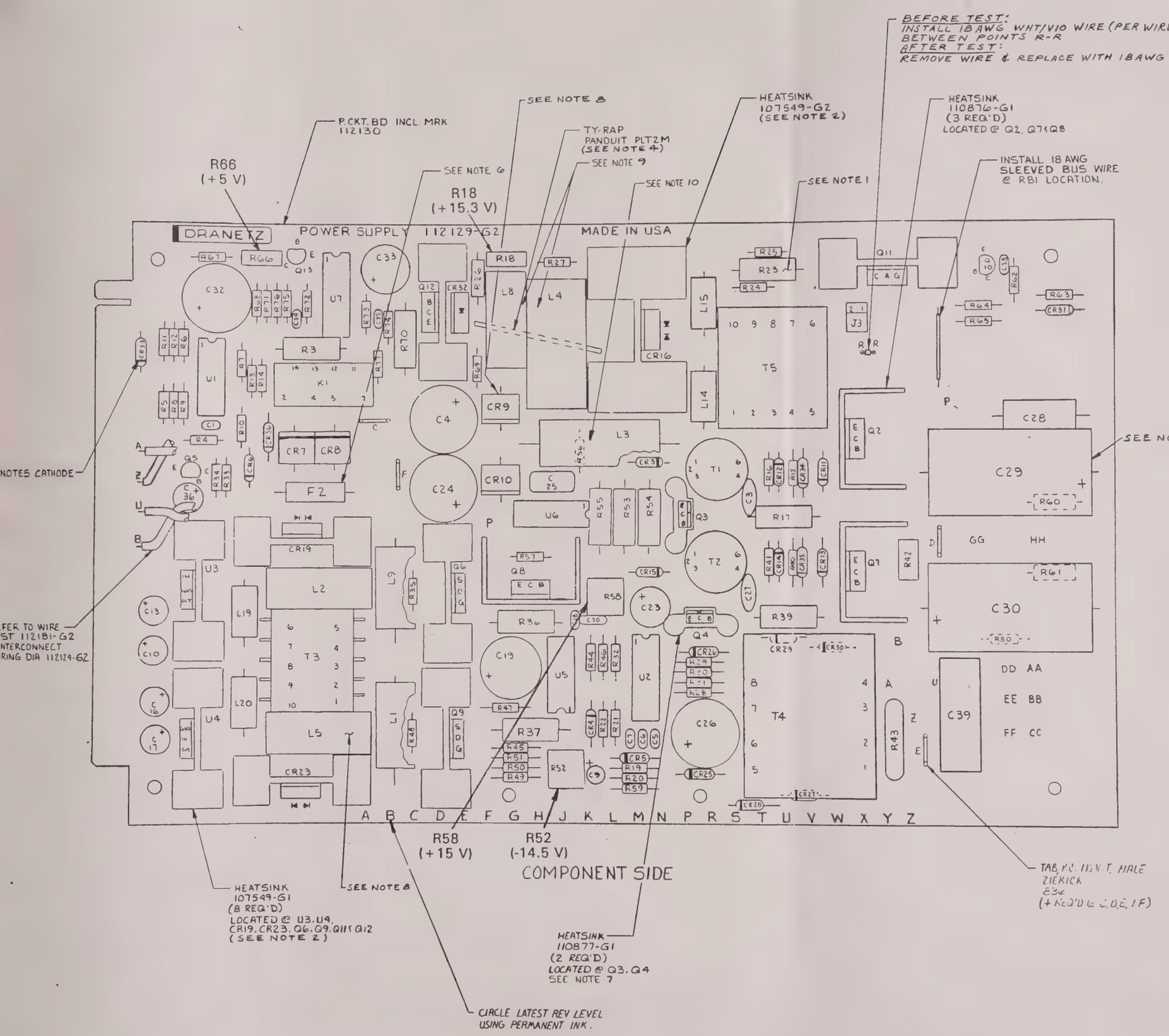


Figure 7-6. Mainframe-Power Supply, Wiring Diagram, 112124-G2, Rev D


BEFORE TEST:
INSTALL 18AWG WHT/VIO WIRE (PER WIRE LIST 112182-G1) BETWEEN POINTS R-R
AFTER TEST:
REMOVE WIRE & REPLACE WITH 18AWG BUS WIRE
P.CKT. BD INCL. MRK 112130
R66 (+5 V)
R18 (+15.3 V)
SEE NOTE 8
TY-RAP PANDUIT PLT2M (SEE NOTE 4)
SEE NOTE 9
SEE NOTE 6
SEE NOTE 10
SEE NOTE 1
HEATSINK 107549-G2 (SEE NOTE 2)
HEATSINK 110876-G1 (3 REQ'D) LOCATED @ Q2, Q7, Q8
INSTALL 18 AWG SLEEVED BUS WIRE @ R81 LOCATION.
DRANETZ
POWER SUPPLY 112129-G2
MADE IN USA
SEE NOTE 5
NOTES CATHODE
REFER TO WIRE LIST 112181-G2 INTERCONNECT WIRING DIA 112129-G2
HEATSINK 107549-G1 (8 REQ'D) LOCATED @ U3, U4, CR19, CR23, Q6, Q9, Q11, Q12 (SEE NOTE 2)
SEE NOTE 8
HEATSINK 110877-G1 (2 REQ'D) LOCATED @ Q3, Q4 SEE NOTE 7
CIRCLE LATEST REV LEVEL USING PERMANENT INK.
R58 (+15 V)
R52 (-14.5 V)
COMPONENT SIDE
TAB, P.C. MOUNT, MALE ZIERICK 636 (4 REQ'D @ C, D, E, & F)

NOTES:

1. THE FOLLOWING COMPONENTS ARE TO BE SPACED 1/16 OFF THE BOARD: R3, R23, R70, & L3.
2. RIVET OR SCREW COMPONENTS TO HEATSINK AS FOLLOWS: CR16, CR19, CR23, Q6, Q9, Q11, Q12, U3 & U4.
3. CR9 IS TO BE SPACED 1/8" OFF THE BOARD & LEADS ARE TO BE TEFLON SLEEVED.
4. USE TY-RAP TO FASTEN L4 & L8 TO BOARD.
5. HEATSHRINK COMPONENTS C29 & C30 WITH CLEAR RAYCHEM KYNAR HEATSHRINK RT850 3/4" DIA. x 2" LG.
6. COVER FUSE BODY USING CLEAR RAYCHEM KYNAR HEATSHRINK RT850 1/4" DIA. x 5/8" LG.
7. PREP INSTRUCTIONS FOR TRANSISTORS Q3 AND Q4:
   A. USE SILICON HEATSINK COMPOUND ON BACK SIDE (METALIZED SIDE) OF TRANSISTOR, COATING SURFACE EVENLY.
   B. PLACE A DAB OF RTV ON FRONT SIDE PLASTIC SIDE OF TRANSISTOR.
   C. SLIDE HEATSINK ONTO TRANSISTOR UNTIL THE METAL STOP ON THE HEATSINK RESTS ON THE TOP BACK EDGE OF THE TRANSISTOR.

RTV INSTRUCTIONS:

8. USE RTV TO MOUNT L2, L5 TO T3.
9. USE RTV TO SECURE L4, L8, TO P.C. BOARD AND TO EACH OTHER.
10. USE RTV TO SECURE BODY AND LEADS OF L3 TO P.C. BOARD.

Figure 7-7. Power Supply PCB A1, Assembly, 112129-G2, Rev F

NOTES:
UNLESS OTHERWISE SPECIFIED:
1. RESISTANCE VALUES ARE IN OHMS ¼ W ± 5%.
2. CAPACITANCE VALUES ARE IN MICROFARADS.
3. DOTTED LINE AROUND COMPONENT INDICATES HEAT SINK [- - -]
4. [A] INDICATES WIRES CONNECTED TO CKT BD.
5. ADJUST R18 TO RAISE VOLTAGE AT ANODE OF CR9 TO 15.3 V. ± .05
6. BEFORE TEST, AN 18 AWG WHT/VIO WIRE IS INSTALLED BETWEEN POINTS R-R. AFTER TEST, WIRE IS REMOVED & REPLACED WITH 18 AWG BUS WIRE

DESIG	TYPE	+5V	GND
U1	LM139J	3	12
U2	SG2524J	—	8
U5,U7	SG2524J	—	8
U3	LM340T12	—	—
U4	LM320T12	—	—
U6	TL497AIN	—	4,5

Figure 7-8. Power Supply PCB A1, Schematic Diagram, 112134-G2, Rev F (Sheet 1)

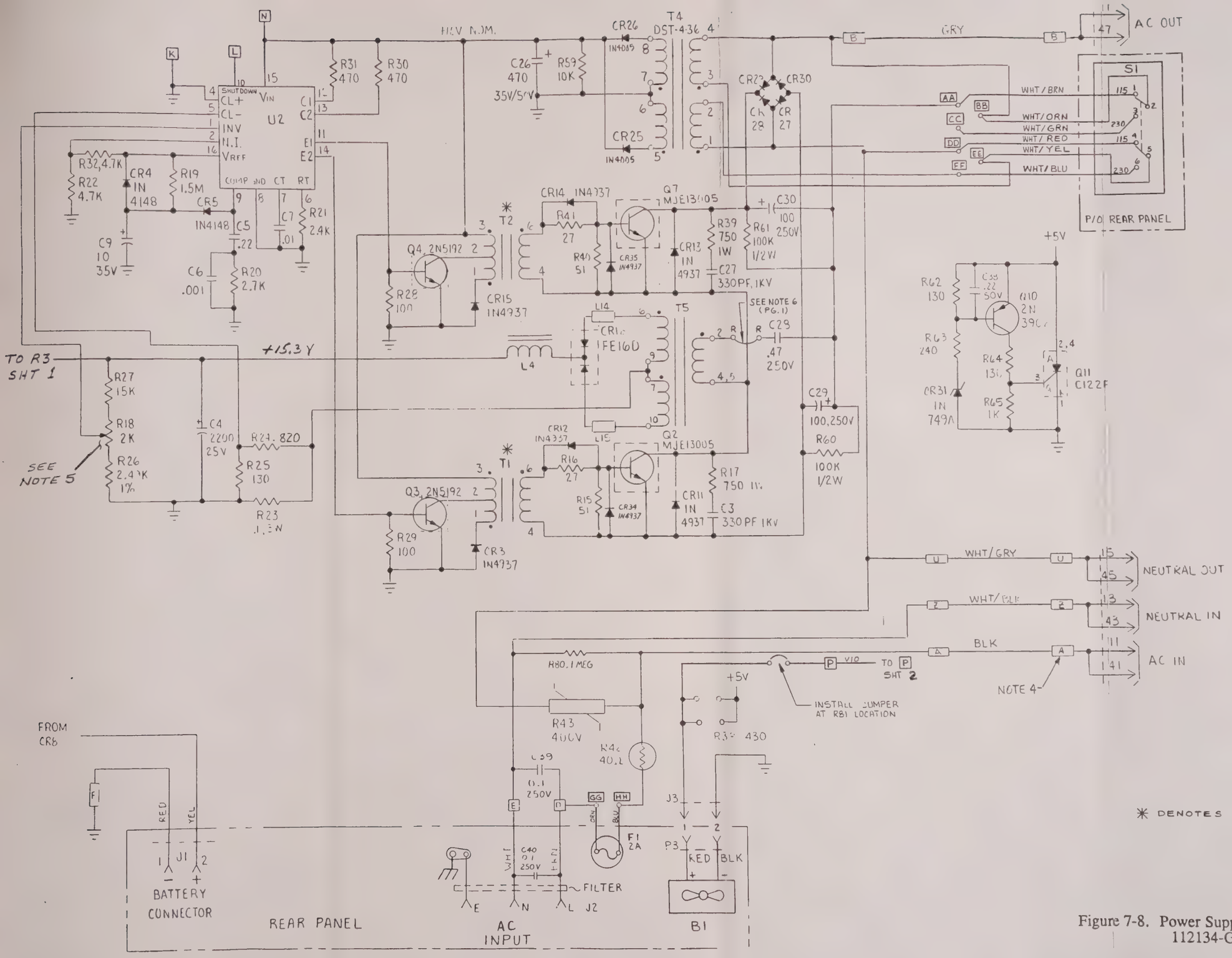
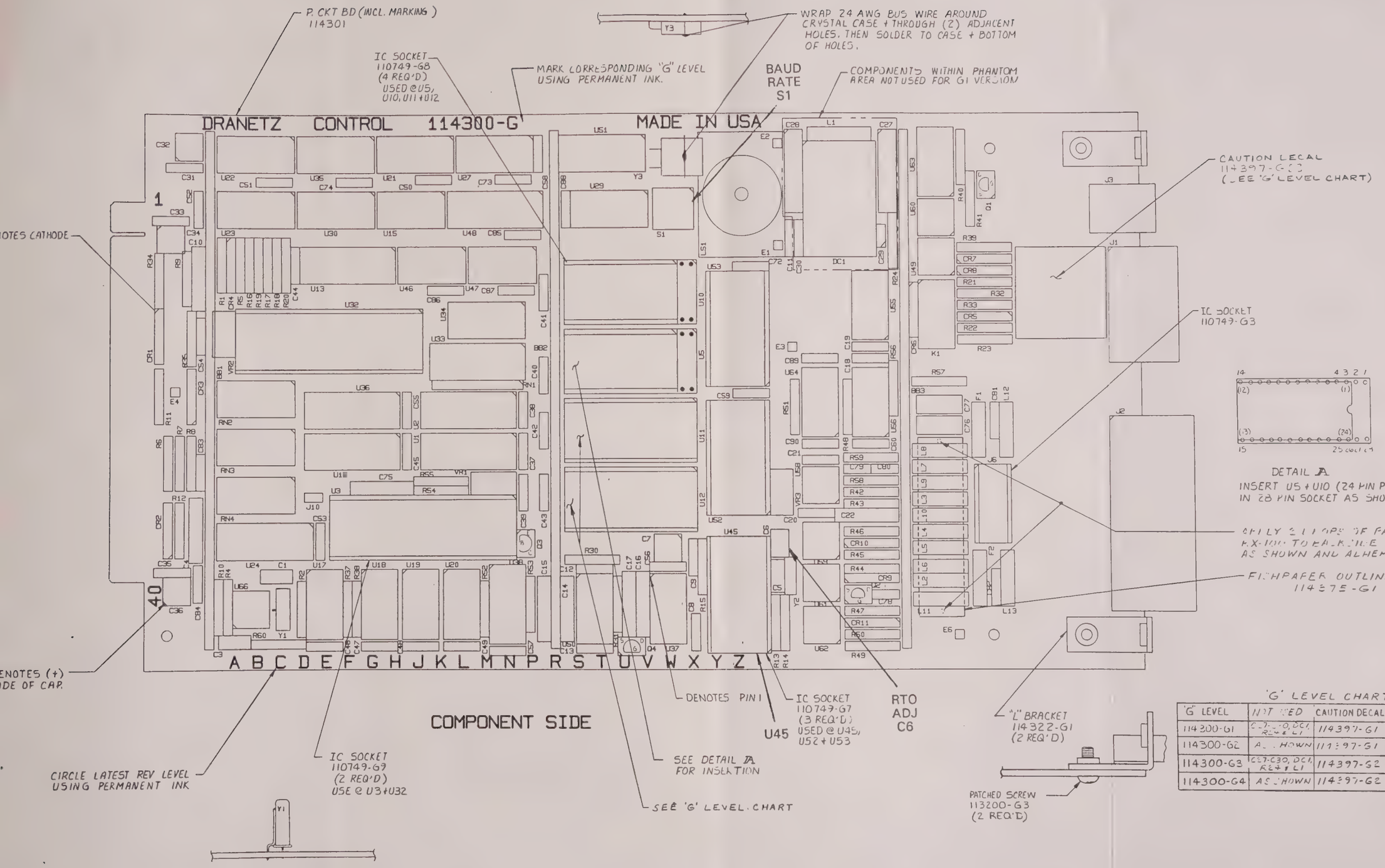


Figure 7-8. Power Supply PCB A1, Schematic Diagram, 112134-G2, Rev F (Sheet 2)


P. CKT BD (INCL. MARKING) 114301
IC SOCKET 110749-G8 (4 REQ'D) USED @ U5, U10, U11 + U12
MARK CORRESPONDING "G" LEVEL USING PERMANENT INK.
WRAP 24 AWG BUS WIRE AROUND CRYSTAL CASE + THROUGH (2) ADJACENT HOLES. THEN SOLDER TO CASE + BOTTOM OF HOLES.
BAUD RATE S1
COMPONENTS WITHIN PHANTOM AREA NOT USED FOR G1 VERSION
DRANETZ CONTROL 114300-G MADE IN USA
CAUTION DECAL 114397-G[ ] (SEE 'G' LEVEL CHART)
IC SOCKET 110749-G3
DETAIL A
INSERT U5 + U10 (24 PIN PKG) IN 28 PIN SOCKET AS SHOWN
ONLY 2 LOOPS OF FABRITEK EX-100 TO BE INSIDE OF FISHPAPER AS SHOWN AND ADHERE TO P.C. BD.
FISHPAPER OUTLINE 114375-G1
DENOTES CATHODE
DENOTES (+) SIDE OF CAP.
COMPONENT SIDE
DENOTES PIN 1
IC SOCKET 110749-G7 (3 REQ'D) USED @ U45, U52 + U53
U45
RTO ADJ C6
"L" BRACKET 114322-G1 (2 REQ'D)
SEE DETAIL A FOR INSERTION
SEE 'G' LEVEL CHART
IC SOCKET 110749-G9 (2 REQ'D) USE @ U3 + U32
CIRCLE LATEST REV LEVEL USING PERMANENT INK
PATCHED SCREW 113200-G3 (2 REQ'D)

'G' LEVEL CHART

'G' LEVEL	NOT USED	CAUTION DECAL	U11 PART NO.	U12 PART
114300-G1	C7-C30, DC1, R24 & L1	114397-G1	105286	1052
114300-G2	AS SHOWN	114397-G1	105286	1052
114300-G3	C27-C30, DC1, R24 & L1	114397-G2	105375	1053
114300-G4	AS SHOWN	114397-G2	105375	1053

Figure 7-9. Control Board PCB A2, Assembly, 114300-G3, Rev D

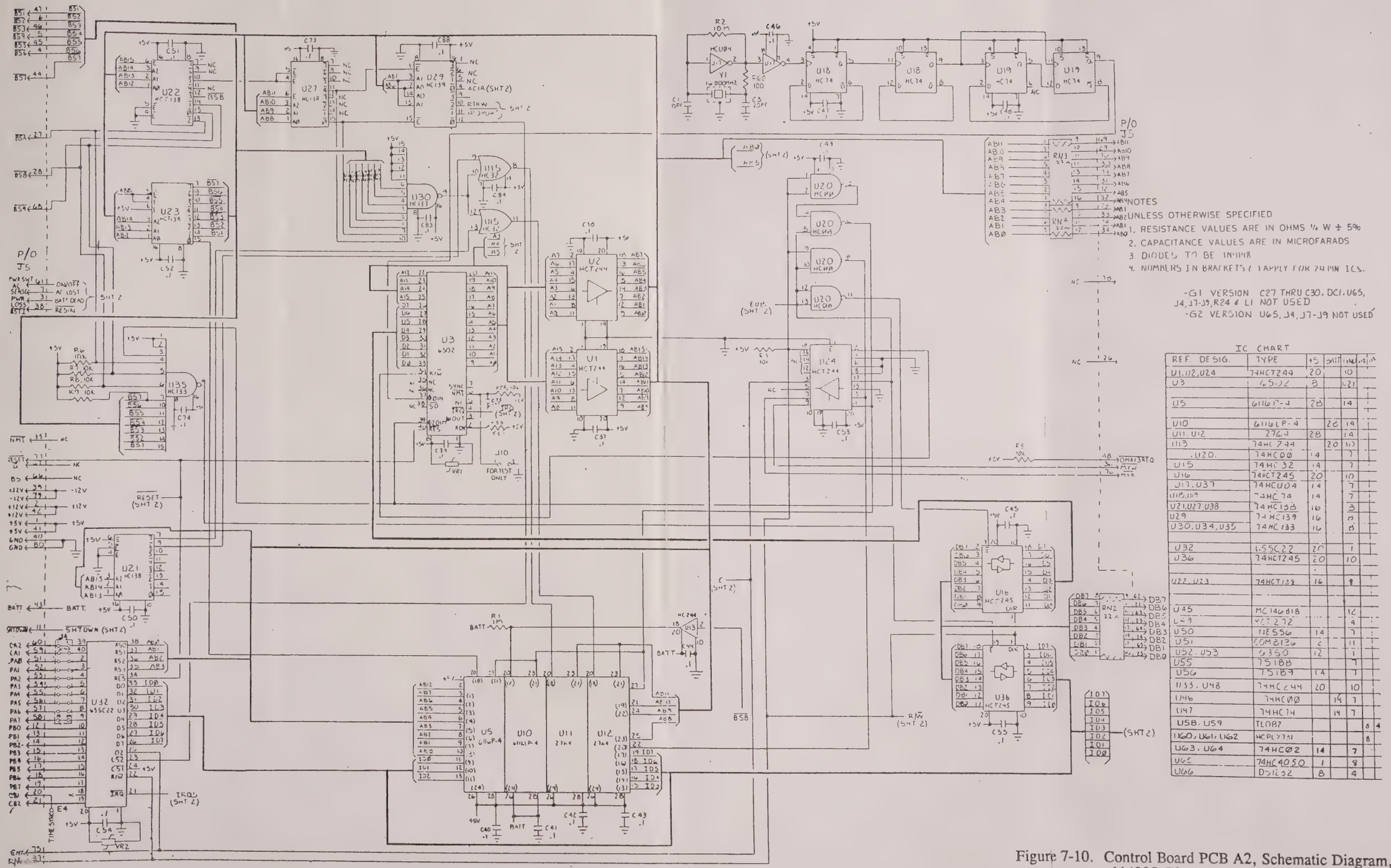


Figure 7-10. Control Board PCB A2, Schematic Diagram, 114305-G2, Rev D (Sheet 1)

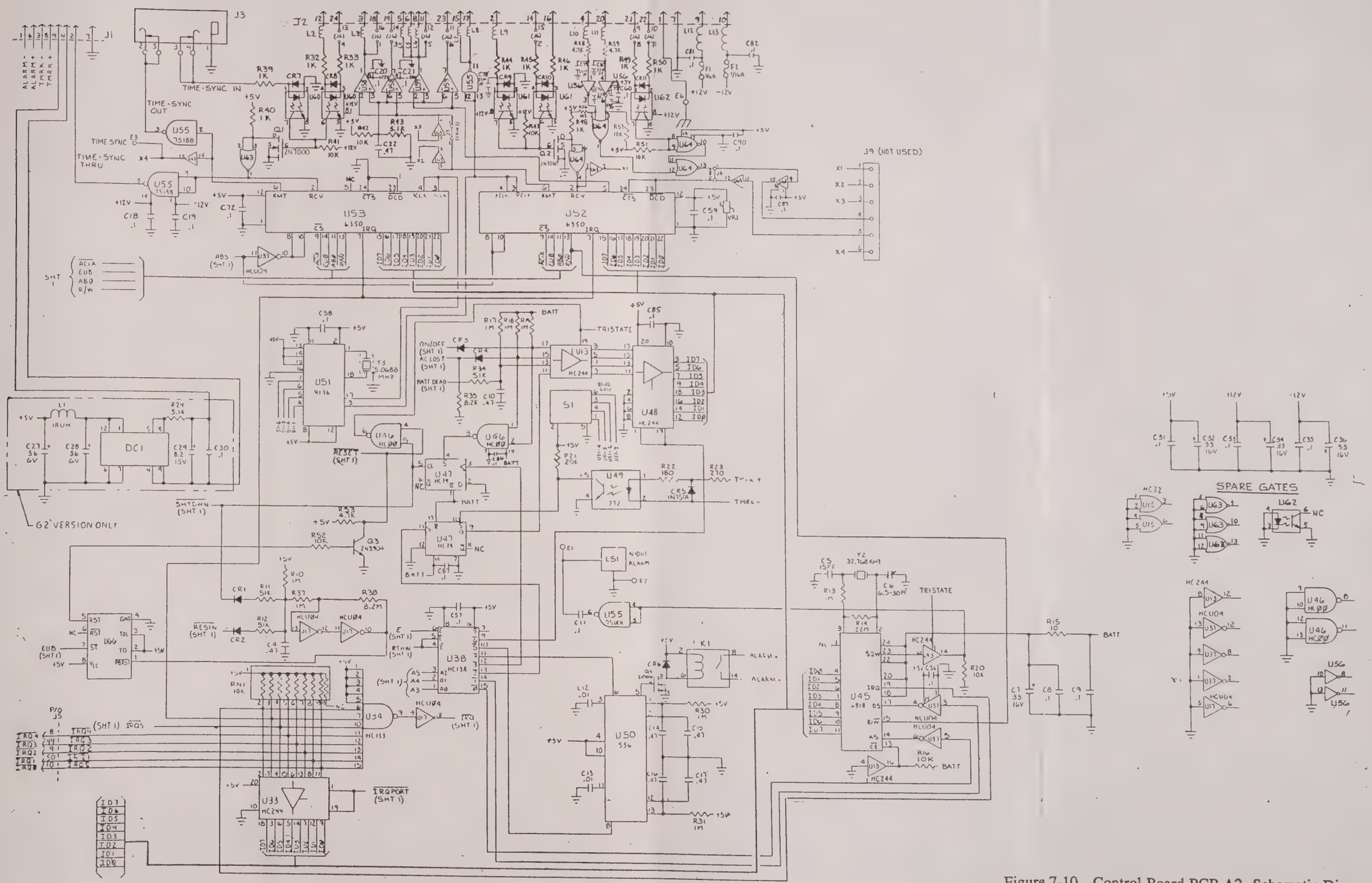
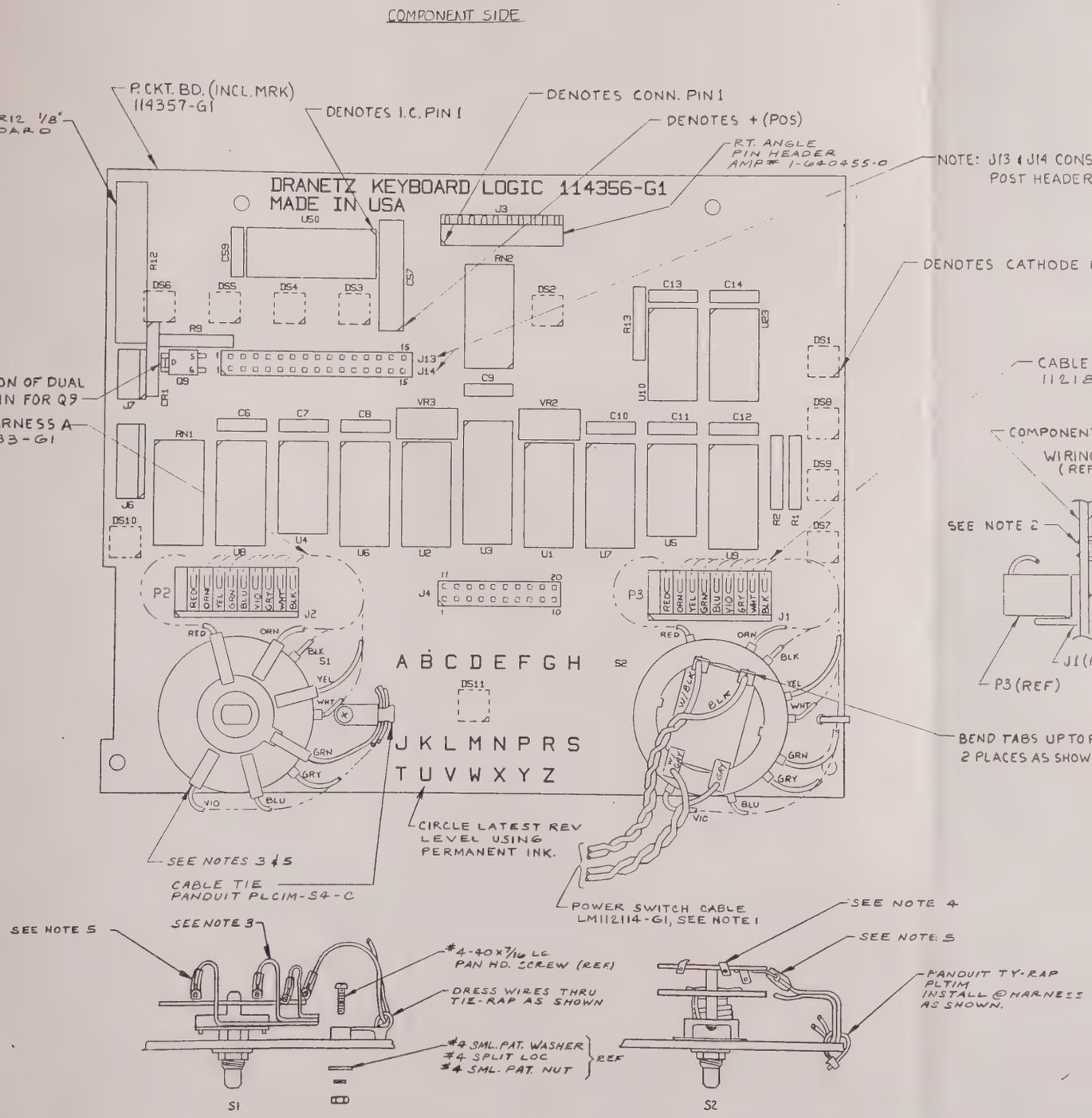


Figure 7-10. Control Board PCB A2, Schematic Diagram, 114305-G2, Rev D (Sheet 2)


COMPONENT SIDE
P. CKT. BD. (INCL. MRK) 114357-G1
DENOTES I.C. PIN 1
DENOTES CONN. PIN 1
DENOTES + (POS)
R.T. ANGLE PIN HEADER AMP# 1-640455-0
SPACE R12 1/8" OFF BOARD
DRANETZ KEYBOARD LOGIC 114356-G1
MADE IN USA
NOTE ORIENTATION OF DUAL PIN ON DRAIN FOR Q9
CABLE HARNESS A 112183-G1
A B C D E F G H
J K L M N P R S
T U V W X Y Z
CIRCLE LATEST REV LEVEL USING PERMANENT INK.
SEE NOTES 3 & 5
CABLE TIE PANDUIT PLCIM-S4-C
POWER SWITCH CABLE LM112114-G1, SEE NOTE 1
SEE NOTE 5
SEE NOTE 3
#4-40 X 7/16 LG. PAN HD. SCREW (REF)
DRESS WIRES THRU TIE-RAP AS SHOWN
#4 SML. PAT. WASHER
#4 SPLIT LOC
#4 SML. PAT. NUT
REF
S1
S2
SEE NOTE 4
SEE NOTE 5
PANDUIT TY-RAP PLT1M INSTALL @ HARNESS AS SHOWN.
NOTE: J13 & J14 CONSIST OF (1) DUAL ROW POST HEADER CALLED "J13/J14".
DENOTES CATHODE FOR L.E.D.
BEND TABS UP TO RIGHT ANGLES 2 PLACES AS SHOWN @ S2
CABLE HARNESS B 112183-G1
COMPONENT SIDE (REF)
WIRING SIDE (REF)
SEE NOTE 2
L.E.D. INSTALLATION TYP FOR DS1-DS11
FLAT DENOTES CATHODE
SPACER .250 DIA X 9/16 LG 110835-G2 TYP FOR DS1-DS11 (11 REQ'D)
J1 (REF)
P3 (REF)

NOTES:

1. REFER TO WIRING DIAGRAM 112102-G2
2. SOLDER L.E.D. LEADS THEN CUT FLUSH TYP FOR DS1 - DS11.
3. ROUTE ALL HARNESS WIRES UP FROM SWITCH TERMINALS ON S1.
4. REROUTE ALL HARNESS WIRES DOWN FROM SWITCH TERMINALS ON S2 BY REBENDING SWITCH TERMINALS DOWN AS SHOWN.
5. USE U.L/CSA APPROVED PVC TUBING, CLEAR, 10 GA., 3/8 LG. COVER EACH TERMINAL/WIRE CONNECTION AS A STRAIN RELIEF, TYP. 9 PLACES ON S1 & 9 PLACES ON S2.

Figure 7-11. Keyboard Logic PCB A8, Assembly, 114356-G1, Rev A

NOTES:
UNLESS OTHERWISE SPECIFIED:
1. RESISTANCE VALUES ARE IN OHMS 1/4 W ± 5%.
2. CAPACITANCE VALUES ARE IN MICROFARADS.
3. SHORTING J7 PIN 1 TO PIN 2 CAUSES PAPER LO CONDITION.

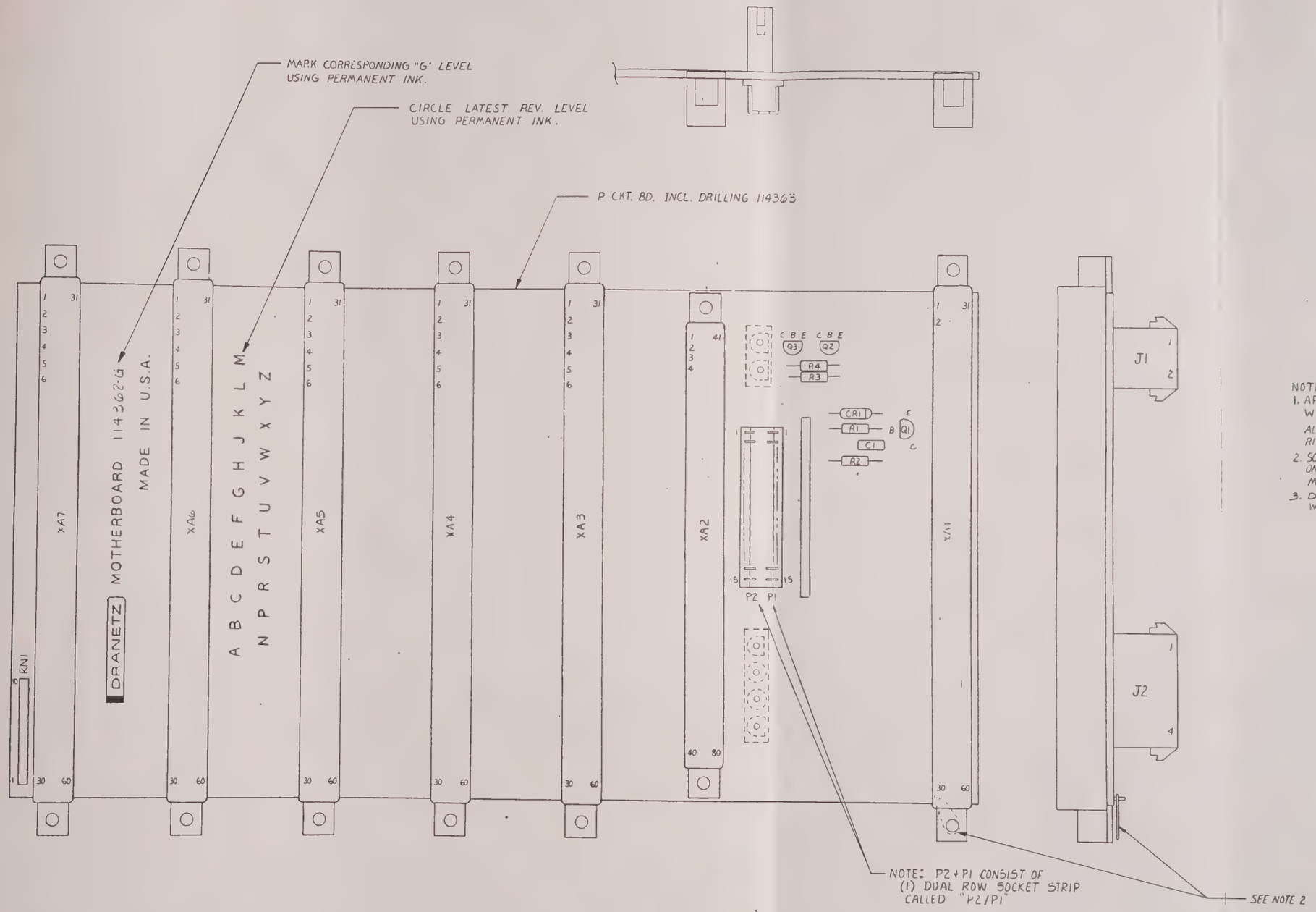
IC CHART

DESIG	TYPE	+5v	⏚
U1,U2	HC 148	16	8
U3	HC244	20	10
U4,U5	HC 05	14	7
U6,U7	HC 238	16	8
U8,U9	HC 259	16	8
U10	HC 00	14	7
U23	HCT04	14	7
U50	HCT244	20	10

SPARE GATES

U23

Figure 7-12. Keyboard Logic PCB A8, Schematic Diagram, 114361-G1, Rev A

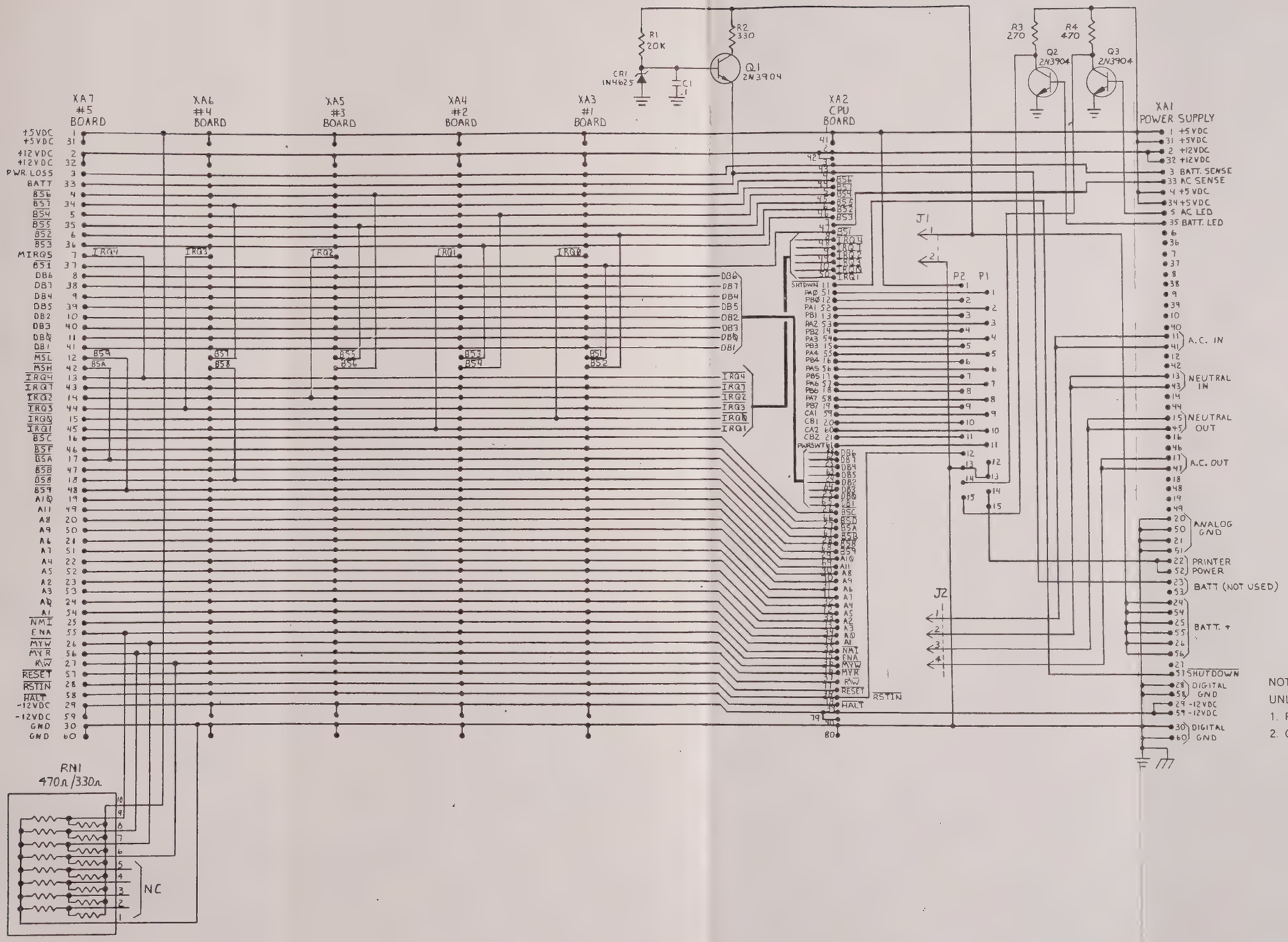


COMPONENT SIDE

NOTES:
1. AFTEK ASSEMBLY CUTOFF PINS PROTRUDING FROM WIRING SIDE OF XA1, BUT DO NOT CUT OFF PINS 30 & 60. ALSO CUT OFF LEADS PROTRUDING FROM WIRING SIDE OF COMPONENTS R1, R2, R3, R4, CR1, C1, Q1, Q2 & Q3.
2. SOLDER GND LUG (ZIERICK 502-120) TO GND PIN 30 OF XA1 ON MOTHERBOARD WIRING SIDE. MOUNTING HOLE OF SOLDER LUG MUST BE ALIGNED WITH MOUNTING HOLE OF CONNECTOR.
3. DO NOT INSTALL KEYING PLUGS SUPPLIED WITH CONNECTORS XA1 - XA7.

G1 VERSION - SEE SHEET 1
G2 VERSION - AS SHOWN

Figure 7-13. Motherboard PCB A9, Assembly, 114362, Rev A



NOTES:
UNLESS OTHERWISE SPECIFIED:
1. RESISTANCE VALUES ARE IN OHMS ¼ W ± 5%.
2. CAPACITANCE VALUES ARE IN MICROFARADS.

Figure 7-14. Motherboard PCB A9, Schematic Diagram, 114366-G2, Rev A

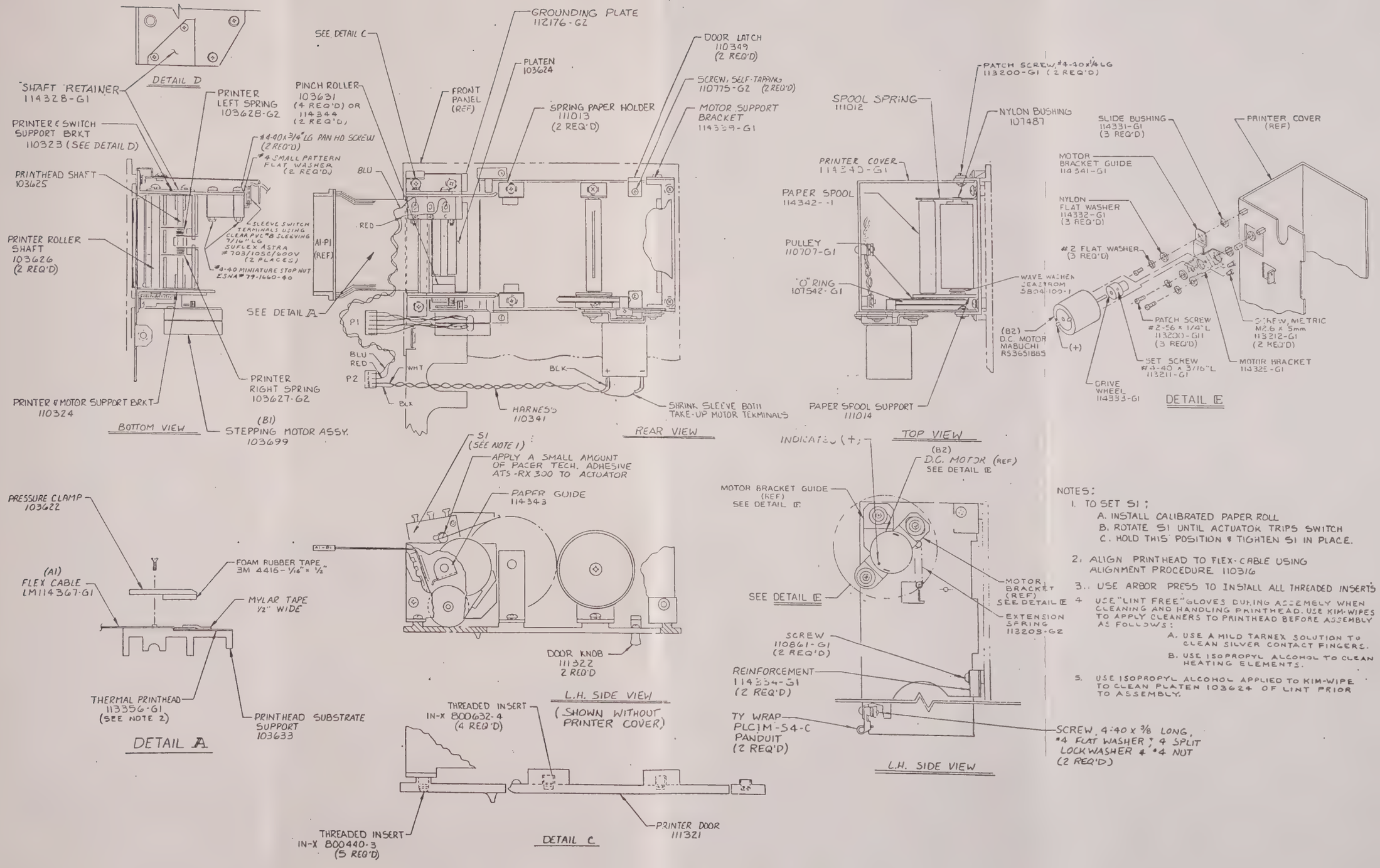
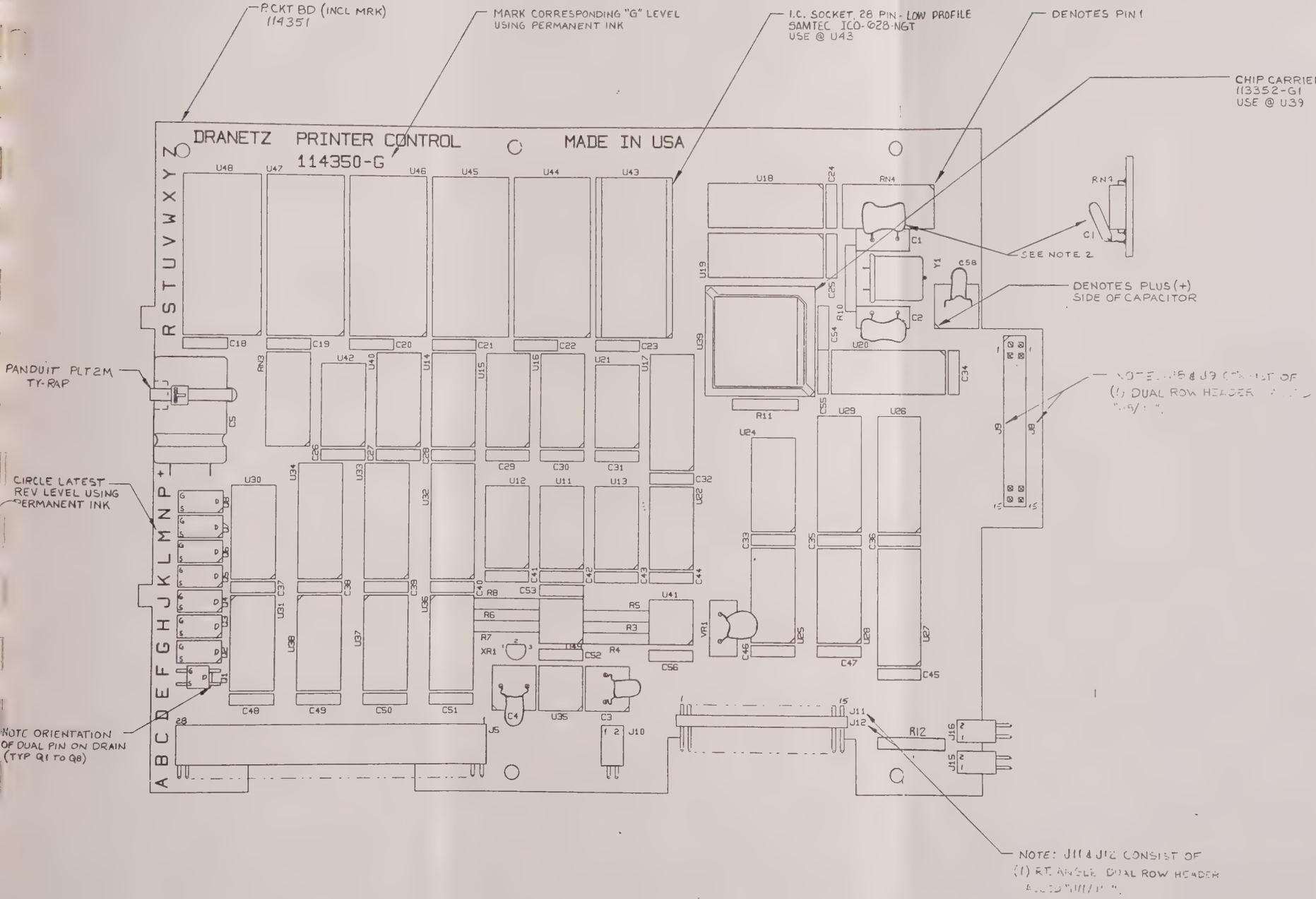

DETAIL D
SHAFT RETAINER 114328-G1
PRINTER LEFT SPRING 103628-G2
PRINTER & SWITCH SUPPORT BRKT 110323 (SEE DETAIL D)
PRINTHEAD SHAFT 103625
PRINTER ROLLER SHAFT 103626 (2 REQ'D)
PRINTER & MOTOR SUPPORT BRKT 110324
BOTTOM VIEW
PRINTER RIGHT SPRING 103627-G2
(B1) STEPPING MOTOR ASSY. 103699
#4-40X3/8"LG PAN HD SCREW (2 REQ'D)
#4 SMALL PATTERN FLAT WASHER (2 REQ'D)
SLEEVE SWITCH TERMINALS USING CLEAR PVC #8 SLEEVING 7/16" LG SUFLEX ASTRA #703/10SC/600V (2 PLACES)
#4-40 MINIATURE STOP NUT ESNA #79-1660-40
SEE DETAIL C
GROUNDING PLATE 112176-G2
PLATEN 103624
PINCH ROLLER 103631 (4 REQ'D) OR 114344 (2 REQ'D)
FRONT PANEL (REF)
SPRING PAPER HOLDER 111013 (2 REQ'D)
DOOR LATCH 110349 (2 REQ'D)
SCREW, SELF-TAPPING 110775-G2 (2 REQ'D)
MOTOR SUPPORT BRACKET 114339-G1
BLU
RED
A1-P1 (REF)
SEE DETAIL A
P1
P2
BLU
RED
WHT
BLK
BLK
HARNESS 110341
SHRINK SLEEVE BOTH TAKE-UP MOTOR TERMINALS
REAR VIEW
PATCH SCREW #4-40X1/4 LG 113200-G1 (2 REQ'D)
SPOOL SPRING 111012
NYLON BUSHING 107487
SLIDE BUSHING 114331-G1 (3 REQ'D)
PRINTER COVER (REF)
PRINTER COVER 114340-G1
MOTOR BRACKET GUIDE 114341-G1
PAPER SPOOL 114342-1
NYLON FLAT WASHER 114332-G1 (3 REQ'D)
#2 FLAT WASHER (3 REQ'D)
PULLEY 110707-G1
"O" RING 107542-G1
WAVE WASHER (EASTROM 5804-100-1)
(B2) D.C. MOTOR MABUCHI RS365188S
(+)
PATCH SCREW #2-56 X 1/4"L 113200-G1 (3 REQ'D)
SCREW, METRIC M2.6 X 5mm 113212-G1 (2 REQ'D)
SET SCREW #4-40 X 3/16"L 113211-G1
MOTOR BRACKET 114332-G1
GRIVE WHEEL 114333-G1
PAPER SPOOL SUPPORT 111014
DETAIL E
S1 (SEE NOTE 1)
APPLY A SMALL AMOUNT OF PACER TECH. ADHESIVE ATS-RX 300 TO ACTUATOR
PAPER GUIDE 114343
A1-P1
DOOR KNOB 111322 2 REQ'D
INDICATOR (+)
TOP VIEW
(B2) D.C. MOTOR (REF) SEE DETAIL E
MOTOR BRACKET GUIDE (REF) SEE DETAIL E
SEE DETAIL E
MOTOR BRACKET (REF) SEE DETAIL E
EXTENSION SPRING 113208-G2
SCREW 110861-G1 (2 REQ'D)
REINFORCEMENT 114354-G1 (2 REQ'D)
TY WRAP PLC1M-S4-C PANDUIT (2 REQ'D)
SCREW, 4-40 X 3/8 LONG, #4 FLAT WASHER & #4 SPLIT LOCKWASHER & #4 NUT (2 REQ'D)
L.H. SIDE VIEW
NOTES:
1. TO SET S1 ;
A. INSTALL CALIBRATED PAPER ROLL
B. ROTATE S1 UNTIL ACTUATOR TRIPS SWITCH
C. HOLD THIS POSITION & TIGHTEN S1 IN PLACE.
2. ALIGN PRINTHEAD TO FLEX-CABLE USING ALIGNMENT PROCEDURE 110316
3. USE ARBOR PRESS TO INSTALL ALL THREADED INSERTS
4. USE "LINT FREE" GLOVES DURING ASSEMELY WHEN CLEANING AND HANDLING PRINTHEAD. USE KIM-WIPES TO APPLY CLEANERS TO PRINTHEAD BEFORE ASSEMBLY AS FOLLOWS:
A. USE A MILD TARNEX SOLUTION TO CLEAN SILVER CONTACT FINGERS.
B. USE ISOPROPYL ALCOHOL TO CLEAN HEATING ELEMENTS.
5. USE ISOPROPYL ALCOHOL APPLIED TO KIM-WIPE TO CLEAN PLATEN 103624 OF LINT PRIOR TO ASSEMBLY.
PRESSURE CLAMP 103622
(A1) FLEX CABLE LM114367-G1
FOAM RUBBER TAPE 3M 4416-1/16" X 1/2"
MYLAR TAPE 1/2" WIDE
THERMAL PRINTHEAD 113356-G1 (SEE NOTE 2)
PRINTHEAD SUBSTRATE SUPPORT 103633
DETAIL A
THREADED INSERT IN-X 800632-4 (4 REQ'D)
L.H. SIDE VIEW (SHOWN WITHOUT PRINTER COVER)
THREADED INSERT IN-X 800440-3 (5 REQ'D)
PRINTER DOOR 111321
DETAIL C

Figure 7-15. Printer Assembly A10, 110345-G5, Rev V


P.CKT BD (INCL MRK) 114351
MARK CORRESPONDING "G" LEVEL USING PERMANENT INK
I.C. SOCKET, 28 PIN - LOW PROFILE SAMTEC ICO-628-NGT USE @ U43
DENOTES PIN 1
CHIP CARRIER SOCKET, 52 PIN 113352-G1 USE @ U39
DRANETZ PRINTER CONTROL 114350-G
MADE IN USA
SEE NOTE 2
DENOTES PLUS (+) SIDE OF CAPACITOR
PANDUIT PLT2M TY-RAP
CIRCLE LATEST REV LEVEL USING PERMANENT INK
NOTE ORIENTATION OF DUAL PIN ON DRAIN (TYP Q1 TO Q8)
NOTE: J11 & J12 CONSIST OF (1) RT. ANGLE DUAL ROW HEADER
NOTE: J11 & J12 CONSIST OF (1) RT. ANGLE DUAL ROW HEADER

"G" LEVEL CHART

"G" LEVEL	NOT USED
-G1	U24, U25, U27, U45-U48
-G2	AS SHOWN

NOTES:

1. TRIM ALL LEAD LENGTHS TO .062 MAX.
2. BEND COMPONENTS C1, C2, C3, C4, C58 AND VR1 OVER TOWARD P.CKT. BD. SURFACE AS SHOWN.

Figure 7-16. Printer Control PCB A11, Assembly, 114350-G1, Rev B

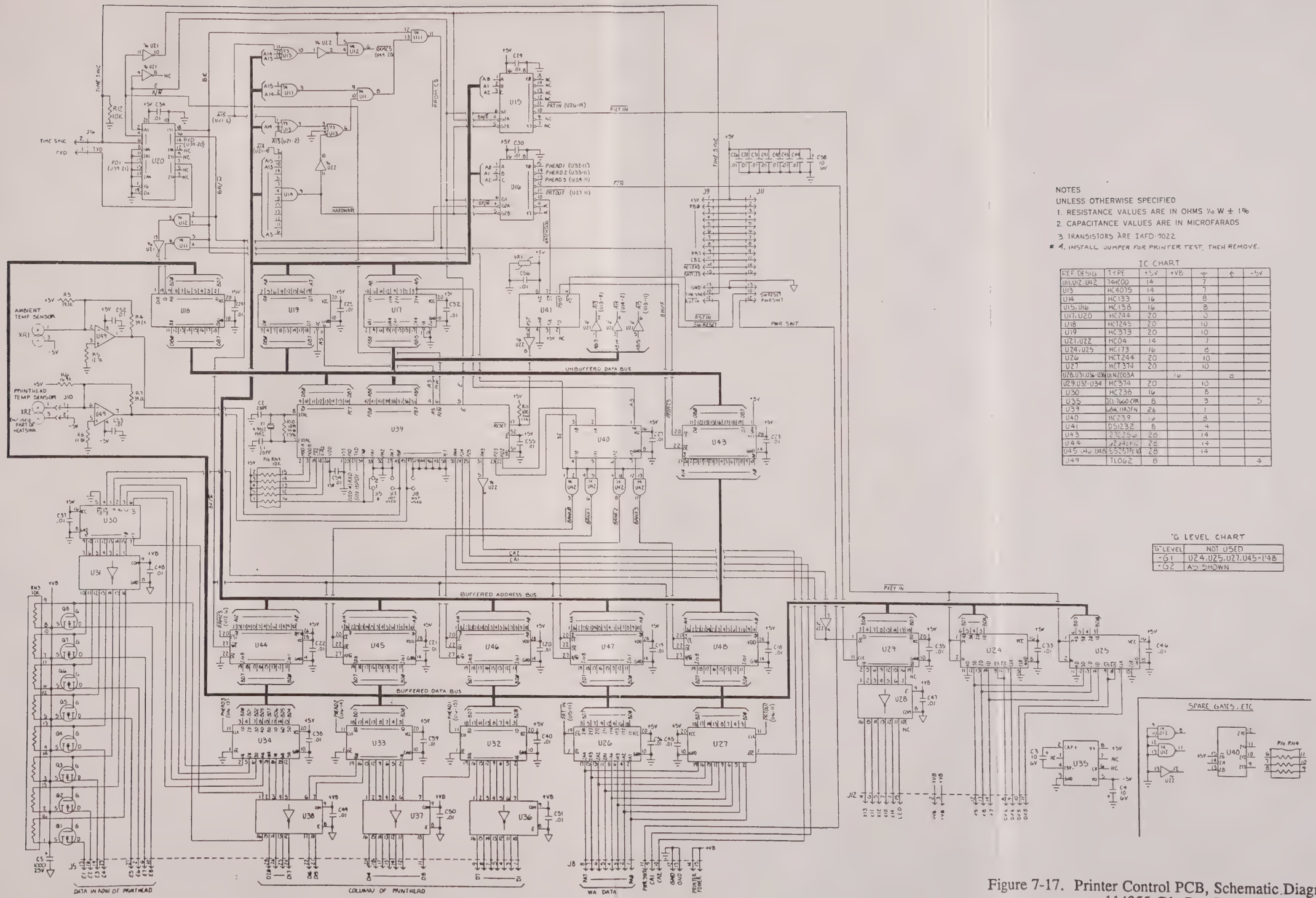
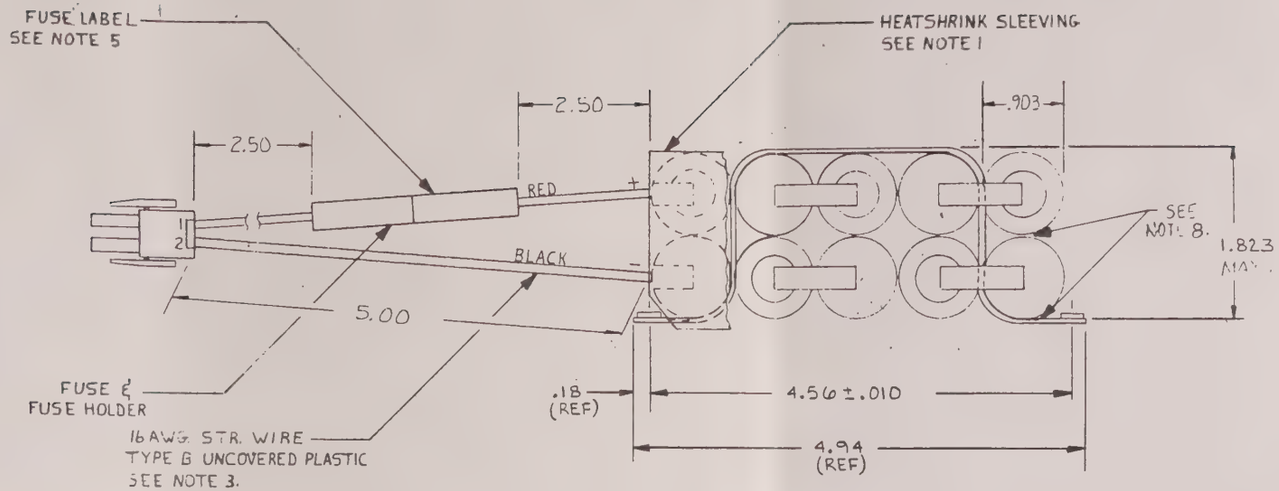
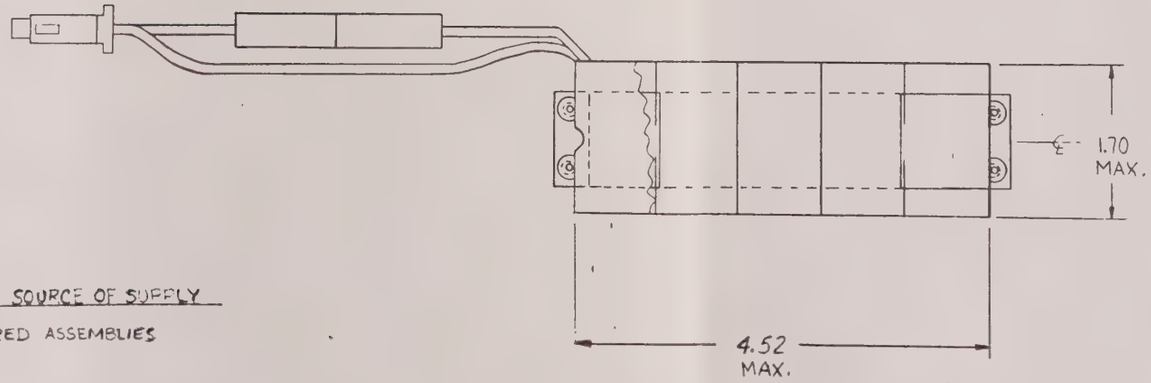

NOTES
UNLESS OTHERWISE SPECIFIED
1. RESISTANCE VALUES ARE IN OHMS ¼ W ± 1%
2. CAPACITANCE VALUES ARE IN MICROFARADS
3. TRANSISTORS ARE IRFD-9022
* 4. INSTALL JUMPER FOR PRINTER TEST, THEN REMOVE.
IC CHART
REF DESIG | TYPE | +5V | +VB | ÷ | ⏚ | -5V
U11,U12,U22 | 74HC00 | 14 | | 7 |
U13 | HC4075 | 14 | | 7 |
U14 | HC133 | 16 | | 8 |
U15,U16 | HC138 | 16 | | 8 |
U17,U20 | HC244 | 20 | | 10 |
U18 | HC1245 | 20 | | 10 |
U19 | HC373 | 20 | | 10 |
U21,U22 | HC04 | 14 | | 7 |
U24,U25 | HC173 | 16 | | 8 |
U26 | HCT244 | 20 | | 10 |
U27 | HCT374 | 20 | | 10 |
U28,U31,U36-U38 | ULN2003A | | 16 | 8 |
U29,U32-U34 | HC374 | 20 | | 10 |
U30 | HC238 | 16 | | 8 |
U35 | ICL7660CPA | 8 | | 3 | 5
U39 | GAL16V8 | 26 | | 1 |
U40 | HC139 | 16 | | 8 |
U41 | DS1232 | 8 | | 4 |
U43 | 27C256 | 28 | | 14 |
U44 | 27C256 | 28 | | 14 |
U45 ,NO U42 | 27C512 | 28 | | 14 |
U49 | TL062 | 8 | | | | 4
'G LEVEL CHART
'G' LEVEL | NOT USED
-G1 | U24,U25,U27,U45-U48
-G2 | AS SHOWN
SPARE GATES, ETC
DATA IN ROW OF PRINTHEAD
COLUMN OF PRINTHEAD
WA DATA
UNBUFFERED DATA BUS
BUFFERED ADDRESS BUS
BUFFERED DATA BUS
AMBIENT TEMP SENSOR
PRINTHEAD TEMP SENSOR
HARDWARE

Figure 7-17. Printer Control PCB, Schematic Diagram, 114355-G1, Rev B



NOTES:

1. COVER ASSY WITH HEATSHRINK SLEEVING WHICH IS COVER UNDER THE U.L. RECOGNIZED COMPONENT PROGRAM.
2. MARK DRANETZ PART NUMBER ON BATTERY PACK.
3. WIRE IS TO BE U.L. LISTED APPLIANCE WIRING MATERIAL.
4. FUSEHOLDER TO BE PLACED IN CENTER OF RED WIRE LEAD.
5. USE HEATSHRINK LABEL TO MARK FUSEHOLDER AS SHOWN, MARKING TO READ AS FOLLOWS: "5A 250V FAST BLO".
6. ALL OTHER MATERIALS USED IN CONSTRUCTION OF BATTERY PACK TO BE U.L. RECOGNIZED.
7. BATTERY PACK OUTPUT VOLTAGE: 12V
   CAPACITY (1 HOUR RATE): 1.2AH
8. USE 3M HOT MELT GLUE P/N 2125 TO SECURE BRKT. TO BATTERIES - BATTERIES TO BATTERIES.



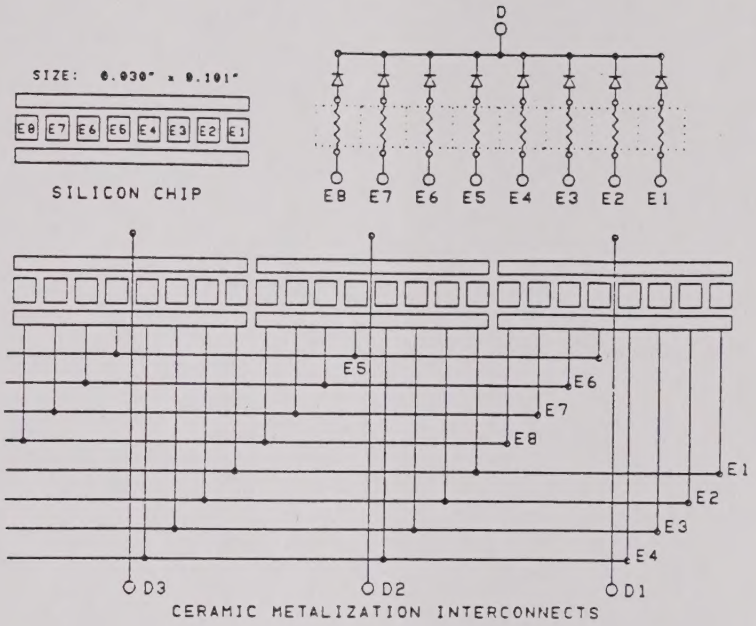
SUGGESTED SOURCE OF SUPPLY

1. ENGINEERED ASSEMBLIES
2. TNR

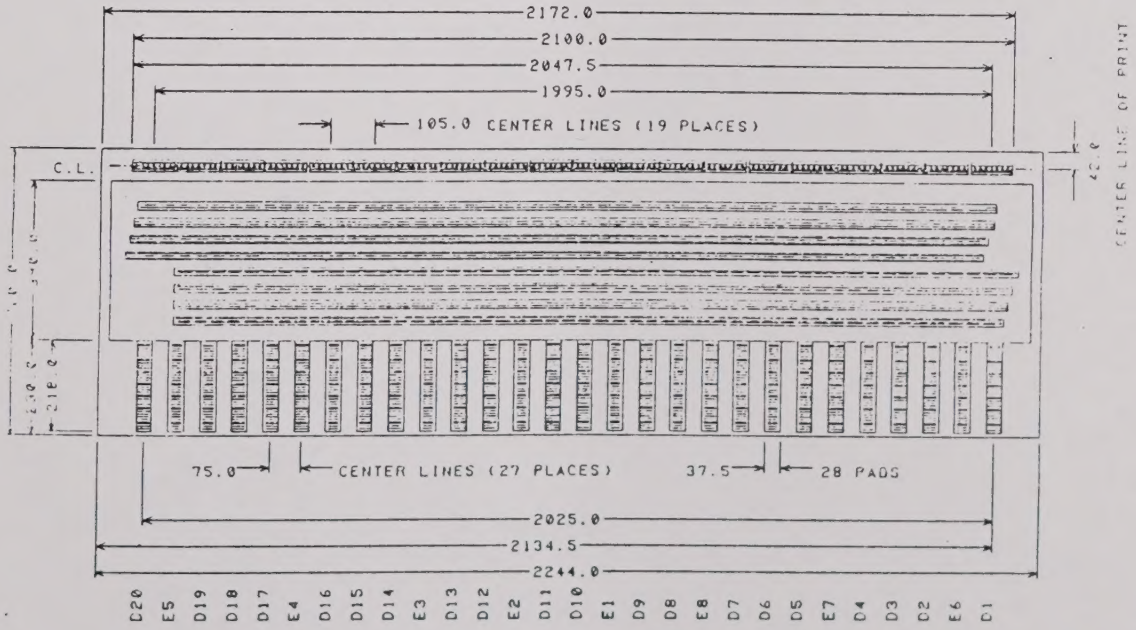
PARTS LIST

G1 QTY.	G2 QTY.	PART NO.
1	0	312005 LITTLE FUSE - FAST BLO FUSE
0	1	F02A250V5A - LITTLE FUSE - FAST BLO FUSE
1	1	552844-1 AMP - INLINE FUSE HOLDER
2	2	350550-1 AMP - SOCKET CONTACTS
1	1	1-420698-0 AMP - CONN. HOUSING - 2 POS.
1	1	BRACKET
5½"	5½"	RED 16 AWG STRANDED WIRE
5½"	5½"	BLACK 16 AWG STRANDED WIRE
10	10	NICAD BATTERY "SUB C" 1.2V, 1.2AH G.E. OR SAFT AMERICA, INC.

Figure 7-18. Battery Pack Assembly, 113345-G1, Rev A



A. Printer Eight Element Beam Lead Silicon Chip Electrical Characteristics



B. Printhead Dimensions

Figure 7-19. Thermal Printer Electrical Characteristics and Dimensions

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